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# Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

No. 188

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20 May 1983

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NUCLEAR DEVELOPMENT AND PROLIFERATION

No. 188

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OVERVIEW OF WORLDWIDE NUCLEAR POWER GENERATION

Duesseldorf ATOMWIRTSCHAFT/ATOMTECHNIK in German Mar 83 pp 156-163

[Text] The annual atw [atomwirtschaft] Quickie Statistics entitled "Nuclear Power Plants--International Overview" for the year 1982 once again cover: the following nine tables on developments in the nuclear power sector throughout the year and on the status as of year's end, as specially prepared for atw:

1. Development of power generation from nuclear energy, 1970-1982;
2. Power generation by individual power plants, 1982;
3. Nuclear reactors, newly under construction in 1982;
4. Nuclear reactors shut down in 1982;
5. Commercial [plant] starts in 1982;
6. Nuclear power plant orders, 1982;
7. Status of nuclear power plants at the end of 1982, by countries;
8. Status by reactor producers;
9. Status by reactor types.

The new edition of the atw Quickie Statistics continues the surveys on developments in nuclear power plants worldwide during the calendar year which has just expired in the form used until now with a total of nine tables.

Table 3, showing the nuclear power plants that went into operation recently, in addition to the data for the first criticality of the reactor, also contains the data on the first power generation of the particular nuclear power plant block (provided it took place within the period of time covered by the report). The criterion for listing under the heading of "newly in operation" however remains the first criticality in this table.

Plants already closed down again are no longer included in the count of blocks in operation although they are given in a footnote in Table 7. Cancelled

projects are no longer contained in all tables. Electric power generated during their operating time by nuclear power plants which have been closed down again are contained in the cumulative nuclear energy current generation figures of the various countries.

Addresses of Staff Members:

Tables 1, 3, 4, and 5: Redaktion "atomwirtschaft", Postfach 1102, 4000 Duesseldorf;

Table 2: Dipl.-Ing. Dr. A. Szeless, Oesterreichische Elektrizitaetswirtschafts-AG--Verbundgesellschaft, AM Hof 6A, A-1011 Wien, Oesterreich;

Tables 6, 7, 8, and 9: Karin Roscher, Kraftwerk Union AG, Postfach 3220, 8520 Erlangen.

Table 1. Development of Power Generation from Nuclear Energy, Worldwide, 1970-1982, by Countries

Land	1970		1975		1979		1980		1981		1982		Veränderung 1981/82	
	GWb	Blöcke	GWb	Blöcke	GWb	Blöcke	GWb	Blöcke	GWb	Blöcke	GWb	Blöcke	Blöcke Stromerz. Blöcke	% 4 5
1	2		2		2		2		2		2		2	
6 BR Deutschland	6 417	6	21 859	10	42 289	15	43 857	14	53 370	14	63 618	15	+ 19,2	+ 1
7 Belgien	720	1	6 173	4	9 574	4	12 549	4	12 856	4	15 668	6	+ 21,9	+ 2
8 Frankreich	5 057	6	19 783	9	42 538	15	61 236	22	105 325	30	108 808	32	+ 3,3	+ 2
9 Großbritannien	26 285	13	30 508	14	38 327	17	37 192	18	38 873	18	44 178	17	+ 13,6	- 1
10 Italien	3 176	3	3 800	3	2 627	4	2 210	4	2 710	4	6 804	3	+151,1	- 1
11 Niederlande	368	1	3 335	2	3 995	2	4 200	2	3 658	2	3 902	2	+ 6,7	-
12 EG (6 Länder) zus.	42 023 <sup>1)</sup>	30 <sup>1)</sup>	85 458	42	139 351	57	161 244	64	216 792	72	242 978	75	+ 12,1	+ 3
13 Finnland	-	-	-	-	6 671	2	6 980	4	14 457	4	16 499	4	+ 14,1	-
14 Jugoslawien	-	-	-	-	-	-	-	-	278	1	2 518	1	...	-
15 Schweden	56	1	11 997	5	21 039	6	26 727	8	37 795	9	38 776	10	+ 2,6	+ 1
16 Schweiz	1 945	1	7 721	3	11 848	4	14 347	4	15 184	4	14 994	4	- 1,3	-
17 Spanien	923	1	6 657	3	5 897	3	5 185	3	9 568	4	8 771	4	- 8,3	-
18 Europa (11 Länder, ohne Ostblock) zus.	44 947	33	111 833	53	184 806	72	214 483	83	294 074	94	324 536	98	+ 10,4	+ 4
USA	22 818	13	175 056	52	279 718	72	265 236	74	288 604	77	300 709	81	+ 4,2	+ 4
19 Argentinien	-	-	2 517	1	2 692	1	2 340	1	2 816	1	1 869	1	- 33,6	-
20 Brasilien	-	-	-	-	-	-	-	-	-	-	54	1	...	+ 1
21 Indien	2 178	1	2 612	3	2 927	3	2 877	4	3 056	4	2 152	4	- 29,6	-
22 Japan	3 296	3	15 938	10	62 003	22	82 760	23	84 582	24	105 178	25	+ 24,4	+ 1
23 Kanada	1 054	2	13 422	7	38 478	10	40 568	11	43 460	11	42 750	14	- 1,6	+ 3
24 Korea (Süd)	-	-	-	-	3 152	1	3 477	1	2 897	1	3 776	2	+ 30,3	+ 1
25 Pakistan	-	-	545	1	35	1	84	1	230	1	84	1	- 63,5	-
Taiwan	-	-	-	-	6 329	2	8 199	2	10 668	3	13 086	4	+ 22,7	+ 1
24 Restliche Welt (8 Länder)	6 629	6	35 034	22	115 616	40	140 305	43	147 709	45	155 863	52	+ 5,5	+ 7
25 Welt, gesamt (20 Länder, ohne Ostblock)	74 294	52	321 944	127	580 141	184	620 024	200	750 347	216	794 194	231	+ 8,7	+ 15

Anmerkung: Rundungsdifferenzen. <sup>1)</sup> Einschl. Großbritannien, das der EG erst seit 1973 angehört.

[See key on following page]

[See Table 1 on preceding page]

Key: 1--Country; 2--Blocks; 3--1981-1982 change; 4--Power generation; 5--Blocks; 6--FRG; 7--Belgium; 8--France; 9--Great Britain; 10--Italy; 11--The Netherlands; 12--EC (six countries), total; 13--Finland; 14--Yugoslavia; 15--Sweden; 16--Switzerland; 17--Spain; 18--Europe (11 countries, excluding East Bloc), total; 19--Argentina; 20--Brazil; 21--India; 22--Canada; 23--South Korea; 24--Rest of world (eight countries); 25--World, total (20 countries, excluding East Bloc); (1) Including Great Britain, which has belonged to the EC only since 1973. Note: Differences due to rounding.

Table 2. Power Generation by Nuclear Power Plants, Worldwide, 1982

Bezeichnung des Kernkraftwerks (el. Bruttoleistung, Reaktortyp, Jahr der Inbetriebnahme)	2	Brutto- stromerzeugung im Jahr 1982 MWh	Last- faktor im Jahr 1982
1			3
4 Bundesrepublik Deutschland: 15 Werke	zus.: 63 617 574		
VAK Kahl (16 MW, BWR, 1961)		90 945 <sup>1</sup>	0.65
MZFR Karlsruhe (58 MW, D <sub>2</sub> O-PWR, 1966)		428 453	0.84
AVR Jülich (15 MW, HTGR, 1967)		84 171	0.64
KWO Obrigheim (345 MW, PWR, 1968)		2 530 410	0.84
KKS Stade (662 MW, PWR, 1972)		5 056 928	0.87
KWU Würgassen (670 MW, BWR, 1972)		1 162 661 <sup>2</sup>	0.20
KNK II Karlsruhe (20 MW, FR, 1973/78)		39 430 <sup>2</sup>	0.23
Biblis A (1204 MW, PWR, 1974)		9 482 110	0.90
Biblis B (1300 MW, PWR, 1976)		9 746 910	0.86
GKN Neckarwestheim (855 MW, PWR, 1976)		6 169 727	0.82
KKB Brunsbüttel (806 MW, BWR, 1976)		3 606 761 <sup>2</sup>	0.51
KKI Isar (907 MW, BWR, 1977)		1 675 610 <sup>2</sup>	0.21
KKU Unterweser (1300 MW, PWR, 1978)		9 668 461	0.85
KKP-1 Philippsburg (900 MW, BWR, 1979)		5 239 450	0.66
KKG Grafenrheinfeld (1299 MW, PWR, 1981)		8 635 547	0.76
5 Argentinien: 1 Werk	zus.: 1 869 444		
Atucha (340 MW, D <sub>2</sub> O-PWR, 1974)		1 869 444 <sup>3</sup>	0.63
6 Belgien: 6 Werke	zus.: 15 667 704 <sup>4</sup>		
BR-3 Mol (11.5 MW, PWR, 1962)		63 163	0.63
Doel-1 (412 MW, PWR, 1974)		3 355 800	0.93
Tihange-1 (920 MW, PWR, 1975)		6 492 630	0.81
Doel-2 (412 MW, PWR, 1975)		2 729 419	0.76
Doel-3 (936 MW, PWR, 1982)		2 786 142 <sup>5</sup>	—
Tihange-2 (941 MW, PWR, 1982)		240 550 <sup>6</sup>	—
7 Brasilien: 1 Werk	zus.: 54 113		
Angra-1 (657 MW, PWR, 1982)		54 113 <sup>7</sup>	—
8 Finnland: 4 Werke	zus.: 16 498 819		
Lovisa-1 (440 MW, PWR, 1977)		3 431 601	0.89
TVO-1 (691 MW, BWR, 1977)		5 176 966	0.86
TVO-2 (691 MW, BWR, 1980)		4 724 321	0.78
Lovisa-2 (440 MW, PWR, 1980)		3 165 931	0.82

[Table 2 continued on following page]

[Table 2 continued from preceding page]

	Bezeichnung des Kernkraftwerks (el. Bruttoleistung, Reaktortyp, Jahr der Inbetriebnahme)		Brutto- stromerzeugung im Jahr 1982 MWh	Last- faktor im Jahr 1982
	1	2		3
9	Frankreich: 32 Werke	ins.: 108 888 136 <sup>2)</sup>		
	Marcoule G-3 (43 MW, GGR, 1959)		181 303	0.48
	Cadarache-2 (240 MW, GGR, 1965)		1 621 506	0.77
	Cadarache-3 (415 MW, GGR, 1966)		738 525 <sup>1)</sup>	0.20
	S. Laurent A-1 (475 MW, GGR, 1969)		2 587 730	0.62
	S. Laurent A-2 (530 MW, GGR, 1971)		363 377 <sup>2)</sup>	0.08
	SEN-Choze (325 MW, PWR, 1967)		2 115 000	0.74
	Meurt d'Arde (75 MW, D <sub>2</sub> O-Gas, 1971)		400 149	0.61
	Bugey-1 (560 MW, GGR, 1972)		3 440 710	0.70
	Palencia (250 MW, FR, 1973)		1 076 610	0.49
	Framingham-1 (930 MW, PWR, 1977)		1 930 601 <sup>2)</sup>	0.24
	Framingham-2 (930 MW, PWR, 1977)		6 300 340	0.77
	Bugey-2 (957 MW, PWR, 1978)		3 500 770	0.42
	Bugey-3 (957 MW, PWR, 1978)		6 298 370	0.75
	Bugey-4 (957 MW, PWR, 1979)		5 700 170	0.68
	Bugey-5 (957 MW, PWR, 1979)		6 074 600	0.72
	Gravelines B-1 (957 MW, PWR, 1980)		3 143 750	0.38
	Dampierre-1 (957 MW, PWR, 1980)		5 326 300	0.64
	Tricastin-1 (957 MW, PWR, 1980)		6 223 110	0.74
	Gravelines B-2 (957 MW, PWR, 1980)		2 238 950	0.27
	Tricastin-2 (957 MW, PWR, 1980)		4 287 760	0.51
	Dampierre-2 (957 MW, PWR, 1980)		4 344 500	0.52
	Gravelines B-3 (957 MW, PWR, 1980)		3 631 420	0.43
	Dampierre-3 (957 MW, PWR, 1981)		3 978 350	0.47
	St. Laurent B-1 (957 MW, PWR, 1981)		702 510 <sup>2)</sup>	0.08
	Tricastin-3 (957 MW, PWR, 1981)		5 301 580	0.63
	Gravelines B-4 (951 MW, PWR, 1981)		5 795 270	0.70
	Tricastin-4 (955 MW, PWR, 1981)		5 707 770	0.68
	St. Laurent B-2 (921 MW, PWR, 1981)		1 462 089 <sup>2)</sup>	0.18
	Blayais-1 (951 MW, PWR, 1981)		6 462 200	0.78
	Dampierre-4 (957 MW, PWR, 1981)		6 073 770	0.72
	Blayais-2 (951 MW, PWR, 1982)		1 799 060 <sup>2)</sup>	—
	Chooz B-1 (900 MW, PWR, 1982)		— <sup>2)</sup>	—
10	Großbritannien: 17 Werke	ins.: 44 177 896		
	Calder Hall (240 MW, 4 GGR, 1956/58)		1 727 789	0.82
	Chapelcross (240 MW, 4 GGR, 1958/60)		1 737 671	0.81
	SGHWR Warrith (100 MW, D <sub>2</sub> O-H <sub>2</sub> O, 1968)		584 605	0.67
	PFR (250 MW, FR, 1976)		121 380 <sup>2)</sup>	0.06
	Berkley (332 MW, 2 GGR, 1962)		307 000 <sup>2)</sup>	0.11
	Bradwell (342 MW, 2 GGR, 1962)		1 059 070	0.35
	Hinkley Point A (664 MW, 2 GGR, 1965)		3 798 600	0.65
	Trawsfynydd (380 MW, 2 GGR, 1965)		3 457 000	0.68
	Dungeness A (580 MW, 2 GGR, 1965)		2 715 000	0.53
	Sizewell A (652 MW, 2 GGR, 1966)		2 287 000	0.40
	Oldbury (663 MW, 2 GGR, 1967)		3 560 000	0.61
	Wylfa (1352 MW, 2 GGR, 1971)		7 154 000	0.60
	Hunterston A-1 (169 MW, GGR, 1964)		931 228	0.63
	Hunterston A-2 (169 MW, GGR, 1964)		1 271 170	0.86
	Hunterston B-1 (660 MW, 1 AGR, 1976)		3 841 660	0.66
	Hunterston B-2 (660 MW, 1 AGR, 1977)		2 987 460	0.52
	Hinkley Point B (1320 MW, 2 AGR, 1976)		6 668 000	0.58

[Table 2 continued on following page]

[Table 2 continued from preceding page]

11	India: 4 Works		
	Tarapur-1 (210 MW, BWR, 1969)	mm.: 2 152 357	
	Tarapur-2 (210 MW, BWR, 1969)	1 112 278 <sup>a</sup>	0.60
	RAPP-1 (220 MW, D <sub>2</sub> O-CANDU, 1973)	556 766 <sup>a</sup>	0.30
	RAPP-2 (220 MW, D <sub>2</sub> O-CANDU, 1980)	49 994 <sup>a</sup>	0.03
12	India: 3 Works		
	Latna (210 MW, GGR, 1963)	433 319 <sup>a</sup>	0.22
	Triso (272 MW, PWR, 1964/65)	6 883 886	
	Caorso (860 MW, BWR, 1978)	916 799	0.50
13	Japan: 25 Works		
	Tokai Mura (166 MW, GGR, 1966)	mm.: 105 177 737	
	Tsuruga (357 MW, BWR, 1969)	897 826	0.62
	Mihama-1 (340 MW, PWR, 1970)	1 702 797	0.54
	Fukushima-1 (460 MW, BWR, 1971)	100 484 <sup>a</sup>	0.03
	Mihama-2 (500 MW, PWR, 1972)	2 482 435	0.62
	Takahama-1 (826 MW, PWR, 1974)	2 371 153	0.54
	Shimane (460 MW, BWR, 1974)	4 082 875	0.56
	Fukushima-2 (784 MW, BWR, 1974)	2 475 978	0.61
	Takahama-2 (826 MW, PWR, 1975)	5 490 300	0.80
	Genka-1 (539 MW, PWR, 1975)	4 356 950	0.60
	Fukushima-3 (784 MW, BWR, 1976)	3 947 882	0.81
	Mihama-3 (826 MW, PWR, 1976)	2 996 568	0.44
	Hamaoka-1 (540 MW, BWR, 1976)	5 524 592	0.76
	Fukushima-5 (784 MW, BWR, 1977)	3 175 374	0.67
	Ikata-1 (566 MW, PWR, 1977)	4 236 392	0.62
	Ono-1 (1175 MW, PWR, 1977)	3 720 783	0.75
	Fukushima-4 (784 MW, BWR, 1978)	6 925 115	0.67
	Tokai-2 (1100 MW, BWR, 1978)	5 925 679	1.86
	Hamaoka-2 (840 MW, BWR, 1978)	5 780 695	(1.60)
	Ono-2 (1175 MW, PWR, 1978)	6 459 883	(1.88)
	Fugen (165 MW, D <sub>2</sub> O-H <sub>2</sub> O, 1978)	8 984 615	0.87
	Fukushima-6 (1100 MW, BWR, 1979)	913 323	0.63
	Genka-2 (539 MW, PWR, 1980)	6 907 040	0.72
	Fukushima II-1 (1100 MW, BWR, 1981)	3 789 757	0.77
	Ikata-2 (566 MW, PWR, 1981)	7 847 460	0.81
14	Jugoslavia: 1 Work		
	Krsko (664 MW, PWR, 1981)	mm.: 2 518 347	
15	Canada: 14 Works		
	NPD Rolphston (20 MW, D <sub>2</sub> O-PWR, 1962)	2 518 247 <sup>a</sup>	0.43
	Douglas Point (220 MW, D <sub>2</sub> O-CANDU, 1967)	42 749 744	
	Gentilly (250 MW, CANDU-BLW, 1971)	179 170	1.02
	Pickering-1 (540 MW, D <sub>2</sub> O-CANDU, 1971)	1 437 773	0.75
	Pickering-2 (540 MW, D <sub>2</sub> O-CANDU, 1971)	0 <sup>(1)</sup>	0.00
	Pickering-3 (540 MW, D <sub>2</sub> O-CANDU, 1972)	3 717 630	0.79
	Pickering-4 (540 MW, D <sub>2</sub> O-CANDU, 1973)	4 318 080	0.91
	Bruce-1 (800 MW, D <sub>2</sub> O-CANDU, 1977)	4 117 960	0.87
	Bruce-2 (800 MW, D <sub>2</sub> O-CANDU, 1977)	4 365 760	0.92
	Bruce-3 (800 MW, D <sub>2</sub> O-CANDU, 1977)	6 288 900	0.90
	Bruce-4 (800 MW, D <sub>2</sub> O-CANDU, 1978)	4 744 700	0.68
	Point Lepreau (680 MW, D <sub>2</sub> O-CANDU, 1982)	6 778 560	0.97
	Pickering B-1 (540 MW, CANDU, 1982)	6 453 060	0.92
	Gentilly-2 (485 MW, CANDU-BLW, 1982)	329 276 <sup>(2)</sup>	—
16	Korea (SAR): 2 Works		
	Ko-R-1 (595 MW, PWR, 1977)	3 776 211	0.72
	Wolsung-1 (679 MW, CANDU, 1982)	3 776 211	— <sup>(3)</sup>

[Table 2 continued on following page]



[Table 2 continued from preceding page]

	Bezeichnung des Kernkraftwerks (el. Bruttoleistung, Reaktortyp, Jahr der Inbetriebnahme)		Brutto- stromerzeugung im Jahr 1982 MWh	Last- faktor im Jahr 1982
	1	2		3
17	Niederlande: 2 Werke Dordrecht (54 MW, BWR, 1968) KCB Borssele (477 MW, PWR, 1973)	sum.:  	3 901 560 394 670 3 506 890	 0.83 0.84
18	Pakistan: 1 Werk KANUPP (137 MW, D <sub>2</sub> O-CANDU, 1971)	sum.: 	83 750 83 750 <sup>9)</sup>	 0.07
19	Schweden: 10 Werke Oskarshamn-1 (460 MW, BWR, 1971) Ringhals-2 (840 MW, PWR, 1974) Oskarshamn-2 (590 MW, BWR, 1974) Ringhals-1 (792 MW, BWR, 1973/74) Barsebeck-1 (590 MW, BWR, 1975) Barsebeck-2 (590 MW, BWR, 1977) Ringhals-3 (980 MW, PWR, 1980) Formark-1 (940 MW, BWR, 1980) Formark-2 (933 MW, BWR, 1981) Ringhals-4 (960 MW, PWR, 1982)	sum.:  	38 776 460 3 078 584 4 793 799 4 466 934 4 885 790 4 106 028 4 802 069 1 110 068 <sup>1)</sup> 5 782 899 5 518 480 231 809 <sup>2)</sup>	 0.76 0.65 0.86 0.70 0.79 0.93 0.13 0.70 0.68 —
20	Schweden: 4 Werke Bjnzau-1 (364 MW, PWR, 1969) Bjnzau-2 (364 MW, PWR, 1971) Mühleberg (336 MW, BWR, 1972) Gögen (970 MW, PWR, 1979)	sum.:  	14 994 330 2 683 470 2 843 910 2 663 150 6 803 800	 0.84 0.89 0.90 0.80
21	Spanien: 4 Werke José Cabrera (160 MW, PWR, 1968) St. Maria de Garoda (440 MW, BWR, 1971) Vandellos (500 MW, GOR, 1972) Almaraz-1 (930 MW, PWR, 1981)	sum.:  	8 770 942 910 300 <sup>14)</sup> 2 189 870 3 166 472 2 504 300 <sup>1)</sup>	 0.65 0.54 0.72 0.31
22	Taiwan: 4 Werke Taipower NI-1 (636 MW, BWR, 1977) Taipower NI-2 (636 MW, BWR, 1978) Taipower KS-1 (985 MW, BWR, 1981) Taipower KS-2 (985 MW, BWR, 1982)	sum.:  	13 886 385 2 922 170 4 471 399 4 410 931 1 281 885 <sup>17)</sup>	 0.52 0.80 0.51 —
23	USA: 81 Werke Shippingport (72 MW, LWR, 1958) Dresden-1 (215 MW, BWR, 1960) Yankee, Rowe (185 MW, PWR, 1960) Big Rock Point (75 MW, BWR, 1962) EBR-2 (10,7 MW, FR, 1964) Hanford-1 HGP (N) (862 MW, H <sub>2</sub> O-Graphit, 1966) Connecticut Yankee (616 MW, PWR, 1967) San Onofre-1 (456 MW, PWR, 1967) La Crosse (55 MW, BWR, 1968) Ginna (515 MW, PWR, 1969) Oyster Creek (670 MW, BWR, 1969) Nine Mile Point (630 MW, BWR, 1969) Dresden-2 (834 MW, BWR, 1970) Millstone-1 (682 MW, BWR, 1970) Point Beach-1 (524 MW, PWR, 1970) Monticello (580 MW, BWR, 1971) H. B. Robinson-2 (739 MW, PWR, 1971) Dresden-3 (832 MW, BWR, 1971) Palisades (723 MW, PWR, 1971) Quad Cities-1 (833 MW, BWR, 1972) Quad Cities-2 (833 MW, BWR, 1972)	sum.:  	380 789 247 302 730 <sup>25)</sup> 0 <sup>18)</sup> 951 171 382 039 86 343 3 744 140 4 765 393 540 000 <sup>2)</sup> 150 330 2 531 832 2 126 260 1 169 791 5 404 980 4 293 900 2 854 510 2 550 516 2 430 738 4 202 040 3 541 940 3 592 949 5 331 601	 0.48 0.00 0.59 0.58 0.92 0.50 0.88 0.14 0.31 0.56 0.50 0.21 0.74 0.72 0.62 0.50 0.38 0.58 0.56 0.49 0.73

[Table 2 continued on following page]

[Table 2 continued from preceding page]

1	Bezeichnung des Kernkraftwerks (el. Bruttoleistung, Reaktortyp, Jahr der Inbetriebnahme)	2	Brutto- stromerzeugung im Jahr 1982 MWh	3	Last- faktor im Jahr 1982
	Surry-1 (824 MW, PWR, 1972)		5 786 830		0.80
	Point Beach-2 (524 MW, PWR, 1972)		3 778 390		0.82
	Pilgrim-1 (687 MW, BWR, 1972)		3 415 590		0.57
	Turkey Point-3 (728 MW, PWR, 1972)		3 966 365		0.62
	Maine Yankee (830 MW, PWR, 1972)		4 752 310		0.65
	Vermont Yankee (540 MW, BWR, 1972)		4 389 176		0.93
	Surry-2 (824 MW, PWR, 1973)		5 805 540		0.80
	Turkey Point-4 (728 MW, PWR, 1973)		4 053 505		0.64
	Zion-1 (1085 MW, PWR, 1973)		4 946 677		0.52
	Fort Calhoun (481 MW, PWR, 1973)		3 661 388		0.87
	Oconee-1 (911 MW, PWR, 1973)		5 708 520		0.72
	Indian Point-2 (920 MW, PWR, 1973)		4 663 410		0.58
	Oconee-2 (911 MW, PWR, 1973)		4 458 124		0.56
	Zion-2 (1085 MW, PWR, 1973)		5 446 398		0.57
	Prairie Island-1 (560 MW, PWR, 1973)		4 171 320		0.85
	Peach Bottom-2 (1098 MW, BWR, 1974)		5 016 740		0.52
	Kewaunee (563 MW, PWR, 1974)		4 015 200		0.81
	Browns Ferry-1 (1098 MW, BWR, 1973)		8 108 277		0.84
	Arnold-1 (565 MW, BWR, 1974)		2 439 877		0.49
	Peach Bottom-3 (1098 MW, BWR, 1974)		8 852 610		0.92
	Browns Ferry-2 (1098 MW, BWR, 1974)		4 592 260		0.48
	Oconee-3 (911 MW, PWR, 1974)		2 837 850		0.36
	Arkansas-1 (880 MW, PWR, 1974)		3 928 288		0.51
	Cooper (800 MW, BWR, 1974)		5 451 441		0.78
	Rancho Seco (967 MW, PWR, 1974)		3 555 582		0.42
	Prairie Island-2 (560 MW, PWR, 1974)		4 105 680		0.84
	Hatch-1 (813 MW, BWR, 1974)		2 918 490		0.41
	Three Mile Island-1 (871 MW, PWR, 1974)		0 <sup>19)</sup>		0.00
	Millstone-2 (881 MW, PWR, 1976)		5 229 350		0.68
	Cook-1 (1089 MW, PWR, 1975)		5 554 070		0.58
	Fitz Patrick (850 MW, BWR, 1976)		5 112 300		0.69
	Brunswick-2 (849 MW, BWR, 1975)		2 022 755		0.27
	St. Lucie-1 (840 MW, PWR, 1976)		7 155 480		0.97
	Calvert Cliffs-1 (880 MW, PWR, 1975)		5 606 946		0.73
	Indian Point-3 (1022 MW, PWR, 1976)		1 502 210 <sup>9)</sup>		0.17
	Browns Ferry-3 (1098 MW, BWR, 1976)		5 041 600		0.52
	Beaver Valley (923 MW, PWR, 1976)		2 862 100		0.35
	Trojan (1216 MW, PWR, 1976)		5 076 565		0.48
	Salem-1 (1136 MW, PWR, 1977)		4 310 470		0.43
	Calvert Cliffs-2 (880 MW, PWR, 1977)		5 267 801		0.68
	Brunswick-1 (849 MW, BWR, 1977)		3 060 980		0.41
	Fort St. Vrain (330 MW, HTGR, 1977)		635 548 <sup>18)</sup>		0.22
	Farley-1 (861 MW, PWR, 1977)		5 536 596		0.73
	Crystal River-3 (868 MW, PWR, 1977)		5 167 026		0.68
	Davis-Besse (934 MW, PWR, 1978)		3 423 453		0.42
	Cook-2 (1133 MW, PWR, 1978)		7 249 770		0.73
	North Anna-1 (947 MW, PWR, 1978)		2 539 010		0.31
	Three Mile Island-2 (961 MW, PWR, 1978)		0 <sup>18)</sup>		0.00
	Hatch-2 (820 MW, BWR, 1978)		3 924 420		0.55
	Arkansas-2 (958 MW, PWR, 1978)		4 003 386		0.48
	North Anna-2 (947 MW, PWR, 1980)		4 277 655		0.52
	Sequoyah-1 (1183 MW, PWR, 1980)		5 111 586		0.49
	Farley-2 (861 MW, PWR, 1981)		5 601 856		0.74
	Salem-2 (1158 MW, PWR, 1981)		8 307 380		0.82
	McGuire-1 (1220 MW, PWR, 1981)		4 598 155		0.43
	Sequoyah-2 (1183 MW, PWR, 1981)		5 473 590		0.53
	LaSalle-1 (1122 MW, BWR, 1982)		520 399 <sup>20)</sup>		—
	San Onofre-2 (1127 MW, PWR, 1982)		195 012 <sup>21)</sup>		—
	Susquehanna-1 (1152 MW, BWR, 1982)		344 420 <sup>22)</sup>		—
	Summer-1 (954 MW, DWR, 1982)		216 217 <sup>23)</sup>		—
Welt: 231 Werke <sup>20)</sup>		Sum.: 794 194 476			

[Key to Table 2 on following page]

[See Table 2 on preceding pages]

Key: 1--Description of nuclear power plants (gross electric output, reactor type, year commissioned); 2--Gross electric power output, 1982; 3--Load factor in 1982; 4--FRG, 15 plants; 5--Argentina, one plant; 6--Belgium, six plants; 7--Brazil, one plant; 8--Finland, four plants; 9--France; 32 plants; 10--Great Britain, 17 plants; 11--India; four plants; 12--Italy, three plants; 13--Japan, 25 plants; 14--Yugoslavia, one plant; 15--Canada, 14 plants; 16--South Korea, two plants; 17--The Netherlands, two plants; 18--Pakistan, one plant; 19--Sweden, 10 plants; 20--Switzerland, four plants; 21--Spain, four plants; 22--Taiwan, four plants; 23--United States, 81 plants; zus.--Total; AGR--Gas-cooled reactor; BSW--Boiling-water reactor; CANDU-BLW--D<sub>2</sub>O-moderated, H<sub>2</sub>O-cooled boiling-water reactor; D<sub>2</sub>O-CANDU--CANDU with light-water cooling; D<sub>2</sub>O-Gas--Heavy-water-moderated, gas-cooled reactor; D<sub>2</sub>O-H<sub>2</sub>O--Heavy-water-moderated, light-water-cooled reactor; D<sub>2</sub>O-PWR--Heavy-water-moderated pressurized water reactor; FR--Fast reactor; GGR--Gas-graphite reactors; H<sub>2</sub>O-Graphite--Graphite-moderated, light-water-cooled reactor; HTGR--Gas-cooled, high-temperature reactor; LWR--Light-water breeder reactor; PWR--Pressurized water reactor; (1) Output limitation; (2) Partly closed down because of remodeling; (3) Partial output reduction on instructions from load distributor; (4) France's share in Tihange was not deducted; (5) Electric power supplied to the grid for the first time on 23 June 1982; (6) Electric power supplied to the grid for the first time on 13 October 1982; (7) First power generation, 1 April 1982; (8) Belgium's share in SENA-Chooz was not deducted; (9) Partly closed down because of repairs; (10) In start-up phase; electric power supplied to the grid for the first time on 3 October 1981; (11) Operating license revoked at the end of 1981; (12) Electric power supplied to the grid for the first time on 11 September 1982; (13) Electric power supplied to the grid for the first time on 19 December 1982; (14) Electric power supplied to the grid for the first time on 4 December 1982; no date; (15) Critical for the first time on 21 November 1982, no data on power generation; (16) Partly out of commission because of strike; (17) Electric power supplied to grid for the first time on 29 June 1982, in commercial operation since 21 October 1982; (18) Out of commission because of inspection, maintenance, repairs; (19) Out of commission because of instructions from authorities; (20) Power supplied to grid for the first time on 4 September 1982; (21) Power supplied to grid for the first time on 20 September 1982; (22) Power supplied to grid for the first time on 16 November 1982; (24) Power supplied to the grid for the first time on 16 November 1982; (24) Power supplied to grid for the first time on 17 July 1982; (25) Closing determined effective 1 October 1982; (26) Power supplied to grid for the first time on 30 November 1982; (27) Power supplied to the grid for the first time on 23 June 1982; (28) Excluding CEMA countries for which no data are available.

Table 3. Nuclear Reactors Newly Placed in Operation in 1982 Worldwide

Name	Land	Standort	Typ	Leistung brutto MWe	5 Leistung netto MWe	Eigentümer bzw. Betreiber	Konstrukteur oder Lieferant	anfangs- betrieb	1. Schwen- ungang
1	2	3	4	5	6	7	8	9	
10 Leistungs- und Versuchsleistungsreaktoren									
Doe-3	12 Belgien	Doe	DWR	936	897	ERES/INTERCOM- UNERG/SPE	15 Framatome (Framatome/ACEC Cordell)	14. 6. 82	23. 6. 82 <sup>1)</sup>
Tihange-2	12 Belgien	Tihange	DWR	941	900	INTERCOM/ERES UNERG/SPE	15 Framatome (Framatome/ACEC Cordell)	5. 10. 82	13. 10. 82
Augs-1	13 Brasilien	Augs das Reis	DWR	657	626	Fernat Controls Electric	Westinghouse (USA)	13. 3. 82	1. 4. 82
Krsko-4	14 Belgien	Krsko	DWR	440	420			23. 6. 82	23. 6. 82
Barras-2	15 Frankreich	Ambre/Grenoble	DWR	951	920	EdF	Framatome	23. 6. 82	17. 7. 82
Choo-1	15 Frankreich	Choo/Laure	DWR	920	874	EdF	Framatome	23. 10. 82	30. 11. 82
Daguerre B-1	16 Großbritannien	Karr	AGR	660	625	CEGB	NRC	23. 12. 82	—
Isar-2	17 Japan	Nishiyama, Elma	DWR	566	538	Shibata Electric Power Co.	Mitsubishi Heavy Industries	31. 7. 81 <sup>1)</sup>	19. 8. 81 <sup>1)</sup>
Point Lepreau	17 Kanada	Point Lepreau, N.B.	D <sub>2</sub> O- CANDU	680	630	New Brunswick Electric Commission	AECL	23. 7. 82	11. 9. 82
Gentilly-2	17 Kanada	Béginmont, Que.	D <sub>2</sub> O- CANDU	685	640	Hydro-Québec	Hydro-Québec AECL	11. 9. 82	4. 12. 82
Pickering B-1	17 Kanada	Pickering, Ontario	D <sub>2</sub> O- CANDU	540	516	Ontario Hydro	AECL	23. 10. 82	19. 12. 82
Wolsong	18 Korea (Süd)	Ulsan	D <sub>2</sub> O- CANDU	679	629	Korea Electric Power	17 AECL (Kanada)	21. 11. 82	31. 12. 82
Ringhals-4	19 Schweden	Ringhals	DWR	960	915	Vattenfall	Westinghouse (USA)	19. 5. 82	23. 6. 82
Kala-1	20 Sowjetunion	Murmansk	DWR	440	420			Jan. 81	Jan. 81 <sup>1)</sup>
Saaremaa-1	20 Sowjetunion	Saaremaa	LOWR	1 000				11. 12. 82	
Nikolajew-1	20 Sowjetunion	Süd-Ukraine	DWR	1 000				25. 12. 82	
Kao-Lang-2	21 Taiwan	Wan-Hsin	SWR	900	930	Taiwan	General Electric (USA)	29. 6. 82 <sup>1)</sup>	
Paks-1	21 Ungarn	Paks	DWR	440	397	MVM	20 ERBE/ Atomenergoprojekt (Sowjetunion)	27. 12. 82	
LaSalle-1	USA	Morris, Ill.	SWR	1 122	1 078	Consolidated Edison	General Electric	21. 6. 82	4. 9. 82 <sup>1)</sup>
San Onofre-2	USA	San Clemente, Calif.	DWR	1 127	1 100	Southern Calif. Edison & L.	Combustion Engineering	26. 7. 82	30. 9. 82
Seabrook-1	USA	Sherborn, Pa.	SWR	1 100	1 050	Peconic Power & Light Co. & L.	General Electric	10. 9. 82	16. 11. 82
Grand Gulf-1	USA	Vicksburg	SWR	1 306	1 250	Mississippi Power & Light Co.	General Electric	18. 8. 82	
V.C. Summer-1	USA	Columbia, S.C.	DWR	950	900	South Carolina E. & Gas & L.	Westinghouse	22. 10. 82	18. 11. 82
11 Forschungs- und Versuchsleistungsreaktoren, kritische Experimente									
RA-4	26 Argentinien	Rio Negro	Schmelz- bad	300 kWb	22	Forschungsinstitut Bartol	CNEA, Lavap, S.A.	Okz. 82 <sup>1)</sup>	
Tiga Mark II	Malaysia	Ten Ismail	Tiga Mark II	1 MWe	22	Forschungsinstitut Ten Ismail	General Atomics (USA)	28. 6. 82	

<sup>1)</sup> Diese Anlage hat IRE auch den kommerziellen Betrieb begonnen (siehe Tab. 5).

<sup>2)</sup> Diese Anlage befindet sich seit der entsprechenden Übernahme (früher als (verfügbare) in der SEC, S. 171 E.). Die hier aufgeführten Reaktoren, die bereits vor dem 31. 12. 81 erstmals kritisch wurden, sind in der Versuchsliste (wegen verspäteter Eingabe der Informationen) noch nicht enthalten.

<sup>3)</sup> Offizielle Eröffnung.

[Key on following page]

[Key to Table 3 on preceding page]

Key: 1--Country; 2--Location; 3--Type; 4--Gross output, MTU; 5--Net, MTU; 6--Owner or operator; 7--Builder or supplier; 8--Critical for the first time; 9--First power generation; 10--Output and experimental output reactors; 11--Research and zero-energy reactors, critical experiments; 12--Belgium; 13--Brazil; 14--Bulgaria; 15--France; 16--Great Britain; 17--Canada; 18--South Korea; 19--Sweden; 20--Soviet Union; 21--Hungary; 22--Research center; 23--May 1982; 24--June 1981 (\*); 25--December 1982; 26--Argentina; (K) This plant began commercial operations also in 1982 (see Table 5); (\*) This table, in terms of time, ties in with the corresponding overview for 1981 (published in atw, 3, 1982, pp 171 ff.). The reactors listed here, which became critical for the first time already prior to 31 December 1981, are not yet contained in the preceding year's list (because information was received too late). (\*\*) Official opening; u.a.--And others.

Table 4. Nuclear Reactors Shut Down Worldwide in 1982

Name	Land	Standort	Einheit	Typ	Leistung	Eigentümer 6 bzw. Betreiber	Konstruktions- Firma 7 oder 8	Inbetriebnahme (1. Inbetriebnahme)	Schließung
1	2	3	4	5	6	7	8	9	10
Gangliano	Italien	10 Sesto Auresio, Caserta	14 Kernkraftwerk	SWR	150 MWe	ENEL	General Elec- tric (USA)	5. 6. 63	1. 1. 82**)
Gastilly-1	Kanada	11 Gastilly, Que.	15 Prototyp-KKW	D <sub>2</sub> O-H <sub>2</sub> O	265 MWe	Hydro Quebec	AECI	12. 11. 70	Nov. 81**)
Shipping- port	USA	16 Shippingport, Pa.	16 Demonstrations- werk	DWR/ LWR- Brüter	90 MWe	Duquesne Light Co. und DOE	Westinghouse	2. 12. 57	1. 10. 82
FRN 12	BR Deutschland	Neuberg 17	Forschungsreaktor III	Tiga Mark III	2 MWe	GSF	GHH	23. 6. 72	16. 12. 82
Mérida 13	Frankreich	Fontenay-aux- Roses	18 Nuklearenergie- reaktor	Tank	—	CEA	CEA	1965	31. 12. 81
Tricast 13	Frankreich	Fontenay-aux- Roses	19 Materialprüf- reaktor	Tank	6,5 MWe	CEA	CEA	7. 7. 59	25. 6. 82
Rapsodie 13	Frankreich	CEN, 20 Cadarache	20 Versuchsreaktor	21 Schnell, Na	40 MWe	CEA	CEA	18. 1. 67	22 Okt. 82***)
ETR	USA	INEL, Idaho 19	Materialprüf- reaktor	Tank	175 MWe	DOE	Phillips Petroleum Co./Honey Weller Co.	19. 9. 57	23 Januar 82

Key: 1--Country; 2--Location; 3--Utilization; 4--Type; 5--Output; 6--Owner or operator; 7--Builder or supplier; 8--Commissioning (first criticality); 9--Shutdown; 10--Italy; 11--Canada; 12--FRG; 13--France; 14--Nuclear power plant; 15--Prototype nuclear power plant; 16--Demonstration plant; 17--Research reactor; 18--Zero-energy reactor; 19--Materials testing reactors; 20--Experimental reactor; 21--Fast; 22--October 1982 (\*\*); 23--January 1982; Mwe--MTU; (\*) Shutdown since August 1978; (\*\*) Shutdown since May 1977; (\*\*\*) Shutdown since January 1982. Note: This table in terms of time ties in with the corresponding table for 1981 (published in atw, 3, 1982, pp 171 ff.). The reactors listed here, which were shut down already prior to 31 December 1981, are not yet contained in the preceding year's list (because information was received too late).

Table 5. Commercial Commissioning of Nuclear Power Plants, Worldwide, 1982

Name	Land	Typ	Leistung MW <sub>e</sub>	Betreiber	Konstrukteur oder Lieferant	1. Strom- erzeugung	Beginn des kommerziell- en Betriebes
	1	2	3	4	5	6	7
KEG Grafenrheinfeld	BR Deutschland	DWR	1 225	Bayerwerk AG	KWU	21. 12. 81	17. 6. 82
Doul-3	9 Belgien	DWR	897	EBES/INTERCOM/ UNERG/SFE	Fransoone (Frankreich) ACEC/Cockerill	23. 6. 82	1. 10. 82
Ikata-2	Japan	DWR	538	Shikoku Electric Power Co.	Mitsubishi Heavy Industries	31. 7. 81	19. 3. 82
Fukushima II-1	Japan	SWR	1 067	Tokyo Electric Co.	General Electric (USA) Toshiba	31. 7. 81	20. 4. 82
Rovno-1	10 Sowjetunion	DWR	420	...	...	Jan. 81	1982
Rovno-2	10 Sowjetunion	DWR	420	...	...	Ende 81	Dez. 82
Tchernobyl-3	10 Sowjetunion	LWGR	1 000	...	...	Ende 81	Juni 82
Kolsk-3	10 Sowjetunion	DWR	420	...	...	Juni 81	Dez. 82
Sesquayab-2	USA	DWR	1 148	TVA	Westinghouse	23. 12. 81	1. 6. 82
LaSalle-1	USA	SWR	1 078	Commonwealth Edison Co.	General Electric	4. 9. 82	20. 10. 82

Key: 1--Country; 2--Type; 3--Output, MTU, net; 4--Operator; 5--Builder or supplier; 6--First power generation; 7--Start of commercial operation; 8--FRG; 9--Belgium; 10--Soviet Union; 11--Power plant union; 12--France.



Table 6. Nuclear Power Plant Orders (Including Letters of Intent), 1982, Broken Down by Makers

Hersteller	Projektbezeichnung	Land	Reaktortyp	Nettoleistung 5 MW/e	Jahr der Inbetriebnahme 6
1	2	3	4	5	6
7	8	9	10	11	12
Fransome <sup>1)</sup>	Peñis-2, -3, -4	8 Frankreich	DWR	3-1275	1994
Sowjetische Industrie <sup>1)</sup>	Kozmoma-1, -2, -3, -4	9 Sowjetunion	LWGR	4-1500	
	Szocienak-3	9 Sowjetunion	LWGR	1500	
	Zimljanskije-1, -2, -3, -4	9 Sowjetunion	DWR	4-1000	
	Privolnij-1, -2, -3, -4	9 Sowjetunion	DWR	4-1000	
	Koloduj-6, -7, -8 <sup>2)</sup>	10 Bulgarien	DWR	3-1000	
	Dessau-1, -2 <sup>2)</sup>	11 DDR	DWR	2-1000	
	Malowce-2, -3, -4 <sup>2)</sup>	12 Tschechoslowakei	DWR	3-1000	
	Paks-5, -6, -7, -8 <sup>2)</sup>	13 Ungarn	DWR	4-1000	
Days AE	Kabrepar-3, -4	14 Indien	CANDU	2-220	
Insgesamt 15	30 Anlagen 16	-	-	31 765	

<sup>1)</sup> In Frankreich und in der UdSSR werden keine einzelnen Auftragsverträge beauftragt; die Projekte werden jedoch als neue Aufträge aufgeführt.  
<sup>2)</sup> Exportvertrag.

Key: 1--Maker; 2--Project designation; 3--Country; 4--Reactor type; 5--Net output, MTU; 6--Year commissioned; 7--Soviet industry (1); 8--France; 9--Soviet Union; 10--Bulgaria; 11--GDR; 12--Czechoslovakia; 13--Hungary; 14--India; 15--Total; 16--30 plants; (1) No individual order or contract awards were announced in France and the USSR; but the projects are being listed as new orders; (2) Export order.



Table 7. Nuclear Power Plants, Worldwide, Broken Down by Countries (as of the End of 1982)

Land	3 in Betrieb <sup>1)</sup>		5 in Bau <sup>2)</sup>		6 best. <sup>3)</sup>		7 insgesamt		Gesamte Atom- erzeugung <sup>4)</sup> bis 31.12.82 GWh
	Anzahl	Nettoleistung MW	Anzahl	Nettoleistung MW	Anzahl	Nettoleistung MW	Anzahl	Nettoleistung MW	
1	2	4	2	4	2	4	2	4	8
9 Argentinien	—	—	—	—	1	622	1	622	—
10 Australien	1	319	2	1 292	—	—	3	1 611	20 374
11 Belgien	6	3 457	2	2 000	—	—	8	5 457	93 851
12 Brasilien	1	636	2	2 490	—	—	3	3 126	54
13 Bulgarien	4	1 680	2	2 000	6	6 000	12	9 680	—
14 BR Deutschland <sup>1)</sup>	15	9 845	12	13 200	3	3 706	30	26 751	351 202
15 DDR	5	1 760	5	3 840	5	3 840	15	9 440	—
16 Finnland	4	2 160	—	—	—	—	4	2 160	50 571
17 Frankreich <sup>1)</sup>	32	23 586	29	32 760	1	1 275	62	57 621	469 955
18 Großbritannien <sup>1)</sup>	33	8 713	9	5 569	1	1 200	43	15 482	994 370
19 Indien	4	784	4	880	4	880	12	2 544	32 079
20 Italien <sup>1)</sup>	3	1 297	3	1 999	2	1 960	8	5 256	51 516
21 Japan	26	16 630	10	9 235	—	—	36	25 865	524 676
22 Jugoslawien	1	632	—	—	—	—	1	632	—
23 Kanada <sup>1)</sup>	13	7 037	7	4 572	5	3 800	25	15 409	2 815
24 Korea	2	1 193	7	6 205	—	—	9	7 398	302 005
25 Kuba	—	—	1	420	—	—	1	420	15 698
26 Lemsberg	—	—	—	—	1	1 347	1	1 347	—
27 Mexiko	—	—	—	—	—	—	—	—	—
28 Niederlande	2	500	—	1 308	—	—	2	1 308	—
29 Palauas	1	125	—	—	—	—	1	125	36 739
30 Philippinen	—	—	—	—	—	—	—	—	3 314
31 Polen	—	—	1	620	1	620	2	1 240	—
32 Rumänien	—	—	2	840	—	—	2	840	—
33 Schweden <sup>1)</sup>	10	7 370	2	600	2	1 020	3	1 620	—
34 Schweiz	4	1 926	1	2 110	—	—	5	4 036	204 671
35 Sowjetunion	40	19 090	25	25 420	2	1 845	7	9 480	111 014
36 Spanien	4	1 953	11	10 202	42	45 500	107	90 010	82 213
37 Südafrika	—	—	2	1 844	—	—	2	1 844	—
38 Taiwan	4	3 110	2	1 814	—	—	6	4 924	41 048
39 Tschechoslowakei	2	840	7	2 940	7	5 260	16	9 040	—
40 Ungarn	1	397	3	1 191	4	4 000	8	5 588	—
41 USA <sup>1)</sup>	80	60 943	62	68 785	18	18 982	160	148 730	2 449 644
36 Gesamt	298	175 993	216	205 078	107	105 793	621	484 864	5 437 809

[Key on following page]

[See Table 7 on preceding page]

Key: 1--Country; 2--Number; 3--In operation (1); 4--Net output, Mw; 5--Under construction (2); 6--Ordered (2); 7--Total; 8--Total atomic [electric] power generation (3) by 31 December 1982; 9--Egypt; 10--Argentina; 11--Belgium; 12--Brazil; 13--Bulgaria; 14--FRG (1); 15--GDR; 16--Finland; 17--France (1); 18--Great Britain (1); 19--India; 20--Italy (1); 21--Yugoslavia; 22--Canada (1); 23--Cuba; 24--Mexico; 25--The Netherlands; 26--The Philippines; 27--Poland; 28--Romania; 29--Sweden (1); 30--Switzerland; 31--Soviet Union; 32--Spain; 33--South Africa; 34--Czechoslovakia; 35--Hungary; 36--Total.

(1) The following nuclear power plants, which have in the meantime again shut down once and for all, are no longer shown in the columns "in operation" and "total": FRG: KKN (100 MTU), HDR (25 MTU), KWL (252 MTU), KRB (252 MTU); France: Chinon-1 (70 MTU), G-2 (40 MTU); Great Britain: PRF Downreay (13 MTU), AGR (28 MTU); Italy: Garigliano (150 MTU); Canada: Gentilly-1 (265 MTU); Sweden: Agesta (12 MTU); United States: Peach Bottom-1 (40 MTU), Shippingport (90 MTU). Furthermore, Iran and Austria are no longer listed because of the unclear situation regarding their nuclear power plant intentions. In this table, the first power generation is considered the commissioning criterion. (2) Excluding suspended plants; (3) Shipments from community power plants in neighboring countries are no longer considered for atomic [electric] current generation.

The following abbreviations were used for the various reactor types (with the exception of Table 2):

AGR--Advanced gas-cooled reactor; DWR--Pressurized-water reactor; D<sub>2</sub>O--Heavy-water reactor; GGR--Gas-graphite reactor; HTR--Gas-cooled high-temperature reactor; LWGR--Light-water-graphite reactor; SNR--Sodium-cooled fast breeder; SWR--Boiling-water reactor.

#### Power Generation

During the 1982 calendar year, worldwide, in 20 countries (excluding the East Bloc for which the corresponding data are missing), 231 nuclear power plants, covered by atw Quickie Statistics, produced a total of 794,194 GWh. Compared to the prior year, 1981, the number of countries producing electric current from nuclear energy was increased by one with the addition of Brazil while the number of nuclear power plants worldwide went up by 15. Current generation from nuclear energy worldwide increased 8.7 percent (see also atw Quickie Statistics "1981 Nuclear Power Plants--World Survey," ATOMWIRTSCHAFT, 27, p 171, March 1982). In the FRG, nuclear current generation in 1982 went up 19.2 percent, in the six EC countries with nuclear power plants it rose by 12.1 percent, in all of Western Europe (11 countries), it went up 10.4 percent and in the United States it grew 4.2 percent. Among the other countries, France recorded an increase of 3.3 percent, Great Britain 13.6 percent, Belgium 21.9 percent, Finland 14.1 percent, and Sweden 2.6 percent, while Switzerland recorded a decline of 1.3 percent and Spain dropped by 8.3 percent.

In Japan, electric power generation from nuclear sources went up 24.4 percent whereas in Canada it dropped 1.6 percent.

Worldwide, the United States continues to dominate; in that country, 81 nuclear power plant blocks produced 300,709 GWh gross. In Western Europe, 98 blocks produced 324,536 GWh, including 75 blocks in the EC with 242,978 GWh. After the United States, France is again in second place with 108,808 GWh from 32 blocks, ahead of Japan with 105,178 GWh from 25 blocks, the FRG with 63,618 GWh from 15 blocks, Great Britain 441,178 GWh, Canada with 42,750 GWh, and Sweden with 38,776 GWh (see tables 1 and 2).

Regarding the total cumulative output from all nuclear power plants recorded since their particular commissioning, which at the end of 1982 worldwide (again without the East Bloc), came to 5,437,809 GWh, the United States continues to be far in the lead with 2,449,644 GWh (Table 7). Next we have, without change, Great Britain with 594,370 GWh ahead of Japan with 524,676 GWh, France with 469,955 GWh, and the FRG with 351,202 GWh. The cumulative output of each individual power plant by the end of 1982 can be seen from the current monthly atw atomic [electric] power statistics for 1982 (on page A-36 in this issue).

#### Commissioning, Orders

According to the atw Quickie Statistics, a total of 21 nuclear power plant blocks, with a total of 16,419 MTU, gross, were newly commissioned in 1982 in 13 countries (Table 3). There are also two new research reactors. In 1982, a total of 10 nuclear power plant blocks in five countries were placed in commercial operation (Table 5); three nuclear power plants and five research and experimental reactors were once and for all shut down in 1982 according to this survey (Table 4). The East Bloc countries are not contained in these data. Nuclear power plant orders stagnated in 1982 so that only new projects were reported from France, the Soviet Union, and India (Table 6).

#### Status as of the End of 1982

According to atw Quickie Statistics, 298 nuclear power plant blocks were in operation worldwide (including the East Bloc) at the end of 1982, with a total of 175,993 MTU, net, in 25 countries (as compared to 277 blocks with 159,200 MTU at the end of 1981). In 27 countries, a total of 216 blocks with 205,078 MTU were under construction and in 18 countries, a total of 107 blocks with 104,013 MTU had been ordered. This gives us a total of 621 blocks with 484,864 MTU, not considering Austria and Iran (Table 7).

Broken down by reactor types, looking at the plants in operation, the pressurized water reactors lead with 138 and 97,949 MTU ahead of the 65 boiling-water reactors with 42,030 MTU, the 42 gas-cooled reactors with 11,511 MTU (including AGR and HTR) and the 23 heavy-water reactors with 9,147 MTU (Table 9). Looking at the plants under construction, the 145 DWR with 143,696 MTU are again in the lead, ahead of 39 SWR with 40,654 MTU, 15 D<sub>2</sub>O reactors with 7,379 MTU, and 10 AGR and HRT with 5,869 MTU. The breakdown of the nuclear power plants worldwide by reactor makers, on the basis of the situation described, does not show any major changes compared to the prior year (Table 8).

Table 8. Nuclear Power Plants, Worldwide, Broken Down by Reactor Makers (as of the End of 1982)

1 Hersteller (Land)	2 Typ	3 MWe netto (Anzahl der Kernkraftwerke)						7 insgesamt		
		4 in Betrieb		5 in Bau		6 bestellt				
		8		8		8		8		
		Inland	Export	Inland	Export	Inland	Export	Inland	Export	
9	AECL (Kanada)	CANDU, D <sub>2</sub> O	7 942 (15)	1 033 (3)	3 932 (6)	1 200 (2)	3 800 (5)	500 (1)	15 674 (26)	2 833 (6)
10	Amerikanische Industrie									
	Babcock & Wilcox (B & W)	DWR	7 732 (9)	—	5 028 (5)	—	2 520 (2)	—	15 280 (16)	—
	Combustion Engineering (CE)	DWR	7 338 (9)	—	10 596 (9)	—	—	—	17 934 (18)	—
	General Electric (GE)	SWR, LWGR	19 698 (28)	5 828 (12)	23 024 (21)	4 098 (5)	9 062 (8)	—	51 764 (57)	9 926 (17)
	General Atomics (GA)	HTR	330 (1)	—	—	—	—	—	330 (1)	—
	Westinghouse	DWR, SNR	25 865 (33)	9 345 (16)	30 137 (27)	11 909 (14)	7 400 (8)	2 278 (3)	63 402 (68)	23 529 (33)
11	ASEA (Schweden)	SWR	4 720 (7)	1 320 (2)	2 110 (2)	—	—	—	6 830 (9)	1 320 (2)
12	Britische Industrie:									
	GEC, AEA, EE	GG, D <sub>2</sub> O	3 612 (19)	160 (1)	—	—	—	—	3 612 (19)	160 (1)
	NNC	AGR, DWR	635 (1)	—	5 566 (9)	—	1 200 (1)	—	7 394 (11)	—
	NPC	AGR	2 500 (4)	—	—	—	—	—	2 500 (4)	—
	TNPG	GG, SNR	1 976 (9)	200 (1)	—	—	—	—	1 976 (9)	200 (1)
13	Dept. AE (Indien)	CANDU	—	—	880 (4)	—	880 (4)	—	1 760 (8)	—
14	Deutsche Industrie:									
	BBC/HR/NUKEM	HTR	15 (1)	—	300 (1)	—	—	—	315 (2)	—
	BBC/BBR	DWR	—	—	1 223 (1)	—	1 247 (1)	—	2 470 (2)	—
	INTERATOM	SNR	18 (1)	—	280 (1)	—	—	—	298 (2)	—
15	Kraftwerk Union (KWU)	DWR/SV, R/D <sub>2</sub> O	9 812 (13)	1 689 (3)	10 166 (8)	5 153 (5)	3 690 (3)	1 000 (1)	23 668 (24)	7 842 (9)
16	Französische Industrie:									
	Fransatom	DWR	20 710 (23)	1 797 (2)	31 560 (28)	3 744 (4)	1 275 (1)	—	53 545 (52)	5 541 (6)
17	andere	SNR, GG, D <sub>2</sub> O	2 584 (9)	—	1 200 (1)	—	—	—	3 784 (10)	—
18	Italienische Industrie:									
	Ansaldo	SWR	840 (1)	—	1 964 (2)	—	—	—	2 804 (3)	—
17	andere	DWR/D <sub>2</sub> O	—	—	35 (1)	—	1 960 (2)	—	1 995 (3)	—
19	Japanische Industrie:									
	Hitachi	SWR	2 292 (4)	—	2 134 (2)	—	—	—	4 426 (6)	—
	Mitsubishi	DWR	4 949 (8)	—	4 467 (5)	—	—	—	9 416 (13)	—
	Toshiba	SWR	4 983 (6)	—	2 634 (3)	—	—	—	7 617 (9)	—
17	andere	D <sub>2</sub> O	148 (1)	—	—	—	—	—	148 (1)	—
20	Sonstige (verschiedene Länder)									
			2 255 (5)	—	2 942 (3)	—	2 065 (2)	—	7 262 (10)	—
21	Sowjetische Industrie	DWR, LWGR	18 090 (34)	4 855 (17)	28 565 (28)	11 231 (20)	45 634 (45)	19 182 (20)	92 286 (107)	35 268 (57)

[See key on following page]

[See Table 8 on preceding page]

Key: 1-- Maker (country); 2--Type; 3--MTU, net (number of nuclear power plants); 4--In operation; 5--Under construction; 6--Ordered; 7--Total; 8--Domestic; 9--Canada; 10--American industry; 11--ASEA, Sweden; 12--British industry; 13--Department AE, India; 14--German industry; 15--Power Plant Union; 16--French Union; 17--Others; 18--Italian industry; 19--Japanese industry; 20--Miscellaneous (various countries); 21--Soviet industry. Note: Excluding plants shut down again or cancelled.

Table 9. World's Nuclear Power Plants, Broken Down by Reactor Types (as of the End of 1982)

Typ	in Betrieb		in Bau		Bestellt		Gesamt <sup>1)</sup>	
	Anzahl	MW	Anzahl	MW	Anzahl	MW	Anzahl	MW
DWR	138	97 949	145	143 696	79	75 526	362	318 171
SWR	65	42 030	39	40 654	10	11 127	114	93 811
D <sub>2</sub> O. CANDU	22	8 882	15	7 379	10	5 280	47	21 541
GGR	35	8 041	—	—	—	—	35	8 041
AGR	5	3 125	9	5 569	—	—	14	8 694
HTR	2	345	1	300	—	—	3	645
SNR. Sonstige	7	2 813	2	1 480	1	360	10	4 653
LWGR	24	12 808	5	6 000	7	10 500	36	29 308
<b>Summe</b>	<b>298</b>	<b>175 993</b>	<b>216</b>	<b>205 078</b>	<b>107</b>	<b>103 793</b>	<b>621</b>	<b>484 864</b>

Key: 1--Type; 2--Number; 3--In operation; 4--Under construction; 5--Ordered; 6--Total (1); 7--SNR, miscellaneous; 8--Sum; (1) Cancelled plants were no longer considered in the totals.

5058

CSO: 5100/2597

## WORLDWIDE AFFAIRS

### BRIEFS

SWEDISH FIRM SEEKS SOUTH KOREA PROJECT—Asea-Atom is seeking to penetrate the reactor market in South Korea. The company's managing director, Lars Halle, is presently in Seoul, the capital, to discuss the possibility of cooperating with a South Korean enterprise in building reactors number 11 and 12, both 900 megawatts, in South Korea. There is a great deal of competition in connection with the project, having an estimated value of 3.4 billion dollars. But Halle believes that the Swedish boiler reactor is simpler, cheaper and safer than the competing French and American reactors, which operate on a water pressure system. Even Canada has shown an interest in this attractive project. [Tex] [Stockholm SVENSKA DAGBLADET in Swedish 14 Apr 83 p 2] 8952

CSO: 5100/2536

# LIBERAL, ALP URANIUM POLICIES BECOME ELECTION ISSUE

## Dilemma for Labor

Canberra THE WEEKEND AUSTRALIAN in English 19-20 Feb 83 p 6

[Article by Nicholas Rothwell]

[Text]

THE ALP's internal wrangles over its uranium policy may emerge again in an election campaign which pits the pro-uranium Fraser Government against a Labor Opposition that is opposed to any expansion of Australia's nuclear exports.

The dilemma for the Labor leader, Mr Hawke, is clear. He is a supporter of uranium development, but his main sponsors in Labor and the ACTU oppose resolutely the export of the nuclear fuel.

The ALP's official position is that "no new mining" would be allowed under a Labor government.

Since uranium is one of the more profitable areas of the resources sector, and because the ALP is planning a huge resources rental tax to support much of its expansionary budget, Mr Hawke faces a simple problem — he must keep the uranium industry in order to tax it.

The mining industry has expressed deep concern over what action an ALP government might take.

In the Northern Territory, where giant uranium-mining projects are major employers, the principal producers have written to Mr Hawke demanding a clarification of the party's position.

The Territory and South Australia both have economies

that expect to benefit heavily from uranium projects in the future, so the stated ALP policy banning new projects is a threat to their interests.

This policy would interrupt progress on a mine now being negotiated at Koongarra, inside the boundaries of the Kakadu National Park in the Territory's Alligator River uranium province. It would even put a question-mark over the nearby Jabiluka giant, which soon could be selling exports worth \$200 million annually.

Established uranium miners in the Territory, such as those at the Ranger mine which also has an output of \$200 million a year, are afraid that Labor would increase already high taxation levels.

The mining sector pays combined federal and State taxes of 72 cents in the dollar. This, combined with the effect of high labor costs, renders many Australian companies uncompetitive in export markets.

## Hard-line

This is despite the fact that almost 40 per cent of Australia's export earnings come from minerals.

In South Australia, ALP opposition to uranium mining raises problems for two small uranium mines in the Lake Frome area, Honeymoon and Beverly, as well as the huge Roxby Downs uranium-cop-



per-gold project, a long-term development that holds uranium ore worth \$80,000 million.

In Western Australia, the Yeelirrie uranium project being developed by Western Mining could be threatened by a hard-line application of ALP policy.

The Northern Territory Chamber of Mines has asked Mr Hawke to spell out what he would do to the Territory's producing uranium mines if he won power.

The chamber has demanded answers to these questions:

**WOULD** Labor give producing mines export licences throughout their active life, and would companies not yet in production be assured of export licences once their mines were on stream?

**WOULD** Labor permit uranium mines with a proven ore body to proceed immediately with planned construction and production?

**WOULD** Labor take legislative or administrative action to close off uranium and other mineral exploration on Aboriginal land in the Territory?

In addition, the Territory mining industry is exploring the possibility of the ALP allowing exploration on Commonwealth-controlled land, and even handing over control

of the key mining areas to the Territory Government.

The ALP's radical wing has repeatedly voiced alarm over the proliferation issues raised by nuclear power. It is also concerned over environmental and land-rights questions in the Northern Territory, and is likely to receive considerable support from sections of the trade union movement in any attempt to enforce stated ALP policy.

As uranium is an issue which unites the radical factions of the ALP against Mr Hawke, it may emerge in a Hawke-led government as one of the critical tests of influence within the party.

In politicking in the Northern Territory and South Australia, the ALP's stand against new mines may also be portrayed as a position that could disadvantage the regional economies.

But the critical factor for the ALP may be the resolute opposition to the policies of the mining companies, and their workers and dependents, in the areas that expect to benefit from new uranium mining.

There are few areas in which a split between Mr Hawke and his party exists and where the Government could make such simple political capital.

### Disagreement in ALP

Canberra THE AUSTRALIAN in English 24 Feb 83 p 5

[Article by Nicholas Rothwell]

[Text]

LABOR's hardline stance against uranium was drastically undercut yesterday in a statement by the party's deputy leader, Mr Bowen, supporting full-scale uranium mining and exploration in the Northern Territory.

The present ALP position on uranium mining is that a Labor government would prevent any new mines coming into production - a stance that threatens proposed uranium mines in the Northern Territory, South Australia, Queensland and Western Australia.

But Mr Bowen said in Darwin the ALP was not against uranium development, and uranium projects in the Terri-

tory could go ahead under an ALP government.

He repeatedly stressed that a Labor government would merely apply more stringent safeguards to Australian exports of the nuclear fuel so that our uranium did not end up in the nuclear weapons programs of foreign nations.

Mr Bowen said the ALP would even support stepped-up exploration of the Northern Territory and would press for enhanced work on Australian schemes to treat and store nuclear wastes.

He said the ALP's main concerns about uranium were that Australian fuel should not be sold to the French unless Paris stopped its testing of nuclear weapons in the Pacific, and that no exports should be made to Finland un-



less there were guarantees our uranium was not finding its way into the Soviet Union's weapons programs.

The ALP was "very interested" in uranium development for Australia but was strongly opposed to the Government's casual attitude to nuclear safeguards.

Questioned about the fate of the two giant uranium deposits in the Northern Territory that are considered unlikely to be developed under current Labor policy — Jabiluka and Koongarra, both near the Kakadu National Park — Mr Bowen said: "If they've got contracts they can go ahead."

### Important

The issue is one of the most controversial in the Northern Territory political arena since 60 per cent of all mining projects in the region are uranium ventures — and in the broader political context, uranium policy is one of the most divisive questions in the federal Labor Party.

Mr Bowen stressed that under an ALP government Australian uranium would not be sold at "bargain basement prices". He said uranium would be a very important fuel for peaceful purposes in the future, but the main market for Australian exports would

only develop in the 1990s.

Mr Bowen's statement has already caused a furore in Darwin where the Government is claiming that the ALP is opposed to the uranium industry.

The deputy leader's statement about the new mines going forward flatly contradicts the party's policy.

Current policy calls for:

**A MORATORIUM** on mining and treatment of uranium in Australia.

**UNEQUIVOCAL** commitment to phase out Australia's involvement in the uranium industry.

**TOTAL** commitment to preventing any new mines from being developed during our period in office (according to the ALP platform).

The huge importance of ALP statements on uranium focus on the value of uranium exports. The Jabiluka deposit holds 207,000 tonnes of uranium yellowcake which would be worth billions of dollars in export revenue.

The two uranium mines now in operation in the Territory — Ranger and Nabarlek, considered to be threatened by a hard-line interpretation of ALP policy — have firm contracts for the export of more than \$5000 million worth of uranium.

### Attack From Northern Territory

Canberra THE AUSTRALIAN in English 25 Feb 83 p 7

[Article by Nicholas Rothwell and John Stanton]

[Text]

THE uranium issue blew up in Labor's face yesterday when the Northern Territory Government launched a concerted attack on ALP statements on mining projects in the Top End.

It coincided with a Federal Government move to exploit the chink in Labor's armor, charging that the ALP's position on uranium was at odds with the union movement's stand.

The Minister for National Development and Energy, Senator Sir John Carrick, campaigning in the NSW south coast seat of Eden-Monaro, said that under a Labor government, an inevitable dis-

pute with the unions over the uranium issue would threaten the much-vaunted accord between the unions and the ALP.

In the Northern Territory, the Chief Minister, Mr Paul Everingham, moved to highlight the ALP's uranium policy, warning that policy statements made by Labor's Deputy Leader, Mr Bowen, proved that a Labor Government would block the region's biggest mining project.

Mr Everingham said the giant Pancontinental mine at Jabiluka would not go ahead under a Labor government because Mr Bowen did not want the country to sell nuclear fuel

to France.

Although the ALP is deeply divided on uranium policy, the issue has not figured greatly in the election campaign.

But the row over Jabiluka and a similar controversy in South Australia concerning the Honeymoon mine project have catapulted the issue into the limelight.

The party's leader, Mr Hawke, has generally been in favor of uranium mining with suitable safeguards, but the party platform calls for a phasing-out of existing uranium mines and a ban on further development.

On Wednesday, Mr Bowen said in Darwin that mines with existing contracts could go ahead - Pancontinental has already signed a contract with British Electric Utilities as well as its tentative deal with the French authorities.

Mr Everingham denounced a scheme outlined by Mr Bowen to set up a task force to check the resources of the region, warning that this ALP plan was "merely a recycling of the old Department of Northern Australian scheme of the Whitlam years".

Sir John's attack on the ALP uranium policy spotlighted Mr Bowen's statements and warned of "massive divisions" in Labor ranks.

"Mr Hawke can't dodge clarifying the ALP situation on uranium - he knows that what Mr Bowen said is in direct conflict with ALP policy, and more importantly, in direct conflict with the ACTU," he said.

CSO: 5100/7522

# FIRE MISSES RADIOACTIVE WASTE, RAISES STORAGE QUESTIONS

## Destruction of Victoria Lab

Melbourne THE AGE in English 1 Mar 83 p 1

[Article by Bill Birnbauer]

[Text]

A city building which houses a radioactive waste dump narrowly escaped a fire yesterday which destroyed a big section of the State Laboratory.

Although fire brigade and Government spokesmen said that the radioactive materials were not endangered by the fire, the incident again raised questions about storing the waste in a densely populated area.

The radioactive waste consisted of radium needles and other radioactive materials used by hospitals such as the Peter MacCallum. It was stored in lead containers in a dump enclosed by metre-thick walls in the basement of one of the buildings next to the printing office.

The Victorian Public Service Association has been campaigning for several years to have the waste removed. The association's general secretary, Mr Monty Burgess, said yesterday that the Premier, Mr Cain, had assured the association that the material would be moved to a dump on land owned by the Department of Agriculture at Westmeadows.

But a spokesman for the Minister for Health, Mr Roper, said yesterday that tests had shown that the waste was not a public health risk and would remain where it was. A spokesman for Mr Cain said yesterday that Mr Cain would prefer the material but no decision had been made on a suitable site.

The co-ordinator of the State

Laboratory, Dr Brian Robinson, said the waste, which consisted of low level radiation materials, was in no danger because of the fire. But he added: "You can never be 100 per cent sure about these things because the recent bushfires burnt things never previously thought possible." The dump was "operationally not in a good place".

The fire started at 3.30 am at the Government Printing Office, one of a maze of old Government buildings behind Treasury Place. The office contains a section of the forensic science laboratory, the Environment Protection Authority and the State Laboratory.

The fire destroyed an annexe of the police forensic laboratory, an equipment store for the Environment Protection Authority, and a store of excess and old chemicals.

Firemen spent most of the day removing dangerous chemicals and transporting them to the hazardous materials division of the Department of Minerals and Energy.

They worked through last night removing truckloads of reactive chemicals from the basement of the Government Printing Office.

Twenty fire vehicles from 13 units brought the blaze under control in about an hour.

Thirty firefighters were at the offices until midnight and 15 firefighters were staying through until this morning.

As with all such fires, the arson squad will be investigating.

## New Dump Plans

Melbourne THE AGE in English 2 Mar 83 p 4

[Article by Bill Birnbauer]

[Text]

The State Government announced late yesterday that it was planning to build a \$130,000 dump for radioactive waste at Westmeadows.

The choice of the Westmeadows site came after hasty discussions between the Premier, Mr Cain, the Minister for Public Works, Mr Simpson, and the Minister for Health, Mr Roper. It is believed that the location has not been approved by Cabinet.

And there seems to have been no consultation with the Broadmeadows council or local groups in the area.

A councillor in the ward selected for the dump, Mr Ian Musgrove, said last night: "To hear this is a bit frightening. We must be the waste dump of Victoria. This is the first I have heard of it."

Mr Musgrove said he would oppose the proposal and believed that he would be backed by the Broadmeadows council.

The State Government's decision to move the dump follows a fire on Monday at the State Parliamentary Offices which narrowly missed a building containing an old radio-active waste storage area. The waste consists of radium needles and other radio-active material used in the treatment of cancer patients at hospitals.

There seemed to be some uncertainty yesterday about the Government's response to the fires. In the morning Mr Cain said that a site had been selected and that "a facility is being constructed to store this material". He later issued a statement which indicated that work on a facility had not yet begun and said that the material was "likely to be stored on Department of Agriculture land

at Attwood in Westmeadows".

Meanwhile, Mr Roper had said that a report prepared last year by the radiation protection officer at Melbourne University had found the storage at Parliament Place safe and he was happy to retain it.

A copy of the report, by the officer, Mr F. P. Robotham, has been obtained by 'The Age'. The report does conclude that the present site does not represent "a significant radiation or contamination hazard to either staff operating the store, or people working in adjacent offices", but it also says the dump is inadequate in several respects.

It says that decontamination of the area would be very difficult, that access to large containers was difficult and, more relevantly, that "there is no fire detector in the store, nor is there an extinguisher, either automatic or hand-held".

The report says: "The store should not be used for the storage of radioactive solvents. The solvents. The present store should present store should be regarded as a temporary expedient."

Mr Robotham's report says that in the long term a properly designed radiation store with decontamination facilities is desirable.

Mr Cain said that the Attwood site was remote from public housing, was under the control of the Department of Agriculture, had the security of being next to a police compound and was "the most appropriate site on the best information available to the Government".

Mr Cain said the Government had chosen Attwood on the best advice available but was interested to hear from public groups about the proposal.

CSO: 5100/7523

WEST ISSUES NEW SAFETY RULES FOR EXPOSURE TO RADIATION

Perth THE WEST AUSTRALIAN in English 1 Mar 83 p 20

[Text]

NEW safety procedures have been gazetted for people working with radioactive substances and radiation-emitting devices.

The rules, to come into effect in six months, will for the first time apply to the use of lasers.

The Minister for Health, Mr Hodge, said yesterday that some lasers used in education, medicine and industry could damage eyesight or burn the skin. Lasers would have to comply with standards specified in the regulations.

Rules governing industrial radiography, X-rays and radioactive substances were based on the recommendations of the International Commission on Radiological Protection which the National Health and Medical Research Council had adopted in Australia.

People were most likely to be exposed to radiation through medical, dental and chiropractic X-rays.

All radiation-producing equipment prescribed in the rules would have to be registered. Many users who did not previously have to hold a licence would have to apply for one.

Licences would be issued only to people with an adequate knowledge of radiation safety and the type of radiation they wanted to use.

The Radiological Council of WA, which implemented the Radiation Safety Act, would publish the regulations during the next six months and would get in touch with professional, trade and other groups affected.

CSO: 5100/7523

URANIUM SALES MAKE RANGER MINE NATION'S MOST PROFITABLE

Melbourne THE AGE in English 18 Feb 83 p 18

[Article by David Uren]

[Text]

**Energy Resources of Australia disclosed a \$24 million interim profit yesterday, confirming Ranger as Australia's most profitable mine.**

The company's uranium sales brought it revenue of \$127.6 million while mining, administrative and royalty costs only came to \$32.3 million.

With just under 3.5 million pounds of uranium mined in the half year, the company is facing production costs of about \$9.30 a pound. Sales contracts are believed to be set at prices of about \$38 a pound.

ERA had a pre-tax profit in the December half of \$53 million from which tax of \$29 million was paid. The profit was after \$30.9 million had been paid in interest charges. Ranger had \$344.3 million in project and vendor loans outstanding at the beginning of the financial year. They are being repaid in equal quarterly instalments through to

the beginning of 1990. Depreciation came to \$11.3 million.

ERA has declared an interim dividend of five cents a share, which will absorb \$16.8 million, or 70 per cent, of the net profit. The company has foreshadowed that the full 1982-83 dividend will be 10 cents a share while its policy thereafter will be to distribute 75 per cent of the profit in dividends.

The two principal shareholders, EZ Industries and Peko Wallsend, will receive \$5.14 million each from the interim payout. Both companies have lent funds to ERA and would also be receiving interest payments.

The Ranger mine started production in October 1981 so the latest half year's results are not comparable with those of the previous December half. The result is in line, however, with the level of profitability reported for the mine's first nine months of operations last August.

CSO: 5100/7522

REVIEW DESCRIBES LOCAL TV SERIES ON NUCLEAR DEBATE

Melbourne THE AGE in English 11 Mar 83 p 2

[Article by Brian Courtis]

[Text] The ABC continues to spend a great deal of its time on programmes about the cold war and the nuclear arms, issues, I would have thought, beyond the control of even its audience.

Wringing hands over the horrors of nuclear warfare makes if impotent TV. Nobody wants the sky to fall in, but nobody in Australia really has much of a say about it.

What are we to make of it? Does Auntie think we all have something to offer to the debate in Washington, Bonn, and London, or is she merely pushing us on the bandwagon?

I have the somewhat cynical feeling that TV's sudden interest in all things Armageddon has not been spurred by concern in Australia (real and sincere though that may be), but reflects the interest of European and American networks.

Anyway, nobody is likely to object to the views expressed. It's not like the Franklin dam, abortion, political corruption, unemployment, neglected Vietnam veterans, or any of the other causes that set off a letter-writing, phone-ringing flurry. Nobody wants the bomb. No sane person wants anybody nuked.

So this weekend the ABC again does its bit for the peace movement with the second of its three-part series on the nuclear threat in 'Four Corners' (Channel 2 at 7.30 pm tomorrow).

This episode, 'God And The Bomb', takes us to the United States where correspondent Jeff McMullen reports on the growing split between the churches over President Reagan's nuclear policies. It focuses on the town of Amarillo in Texas, site of America's nuclear bomb factory, Pantex.

Can one be Christian, the programme asks, and wage nuclear warfare? Most Roman Catholic bishops in the US believe not. They want a nuclear freeze and are completing a pastoral letter, addressed to the American people, to that effect.



The letter, says Leroy Matthiesen, Catholic bishop of Amarillo, will point out that "we're facing not just a threat to our national security, we're facing a threat to the whole human race."

But the Rev. Jerry Falwell and other Protestant leaders see the Catholic clergymen as "socialist sell-outs." Their attitude appears to be that the Russians can never be trusted and Washington must be ready to strike. "I personally believe that God will judge America," says Mr Falwell, "possibly with Soviet missiles."

In Amarillo, the question has been reduced to whether it is immoral to work at Pantex itself. The Rev. Matthiesen obviously believes it is. But workers at the plant are paid an average of \$20,000 a year for capping the nuclear weapons, compared with an average \$13,000 elsewhere in town.

McMullen meets the Rev. Alan Ford, of the Southwestern Baptist Church, a minister who supports the 2500 who help build up the nuclear arsenal. Not only was it moral to work there he says, it was patriotic. "The truth is that somebody has to be willing to do what has to be done."

But the most intriguing, and perhaps alarming, comment in tomorrow's 'Four Corners' comes from the Rev. Matthiesen. Brute force, he suggests, has become a policy. Many believe that Vietnam was lost because the US didn't try hard enough. "I think," he says, "some people here are spoiling for another war so that they can prove that that was a fluke."

CSO: 5100/7524



BRIEFS

DISPOSITION OF A-TEST SITE--ADELAIDE--The return of the former atomic bomb test site in South Australia's far west to its traditional Aboriginal owners would fulfil a 30-year-old promise, the Aboriginal Land Rights Movement said yesterday. The Legal Rights spokesman, Mr Gary Hiskey, said the decision to hand back the land, which included the Maralinga test site, would fulfil the promise made by Sir Thomas Playford and neglected by successive Governments. Mr Hiskey said the Aboriginal people had maintained their traditional culture and religious beliefs despite being denied access to their land for a long time. The Government had responded to the wishes of the Maralinga people who have always regarded themselves as Pitjantjatjara people. [Melbourne THE AGE in English 12 Mar 83 p 5]

CSO: 5100/7524

DUTCH ASSISTANCE TO NUCLEAR DEVELOPMENT PROGRAM DECRIED

Amsterdam DE TIJD in Dutch 1 Apr 83 pp 8-11

[Text] Last week Argentines, wherever they might be in the world, marked the seventh anniversary of the military dictatorship in their country. In addition to thousands of "missing people" and a lost war, the regime can boast of an extensive military nuclear program that has brought the Bomb within close reach. Businesses and administrations in the Netherlands have cooperated in this, and have done so with shoddy procedures and a shocking sense of responsibility.

It is amusing, actually: Argentina cannot, as far as we know, have smuggled a Dr Khan into the UCN factory, but then 200 Argentine naval officers are living and working easily within a stone's throw away. Let us assume, though, that they are honestly limiting themselves to their courses in military electronics at Holland Signal and that the Almelo atomic bunker remains off limits to them as for, say, antinuclear demonstrators. If all these assumptions are valid, a report can then be made of the voluntary Dutch contribution to Argentina's nuclear program.

\* \* \*

"The cybernetic system referred to in your first question must be regarded as a common industrial product in general use. And there was nothing standing in the way of its export." In dry, almost annoyed tones, Minister Van Aardenne dispatched Van der Spek, PSP [Pacifist Socialist Party] member of Parliament. Yes, the minister shares the view that proliferation of nuclear weapons and nuclear weapons technology must be prevented and that it may thus be necessary to refuse export permits for particular, technically valuable products. But in the present case, the Netherlands is "neither directly nor indirectly" contributing to this proliferation. Moreover, only under "certain specific circumstances" can an export permit be canceled. "In this case, no such circumstances can be demonstrated."

Foxboro is happy, Argentina is happy, and the Bomb is a bit closer. Professor Frank Barnaby, former director of the Swedish Peace Institute SIPRI, laments: "I cannot believe it--countless countries have acquired nuclear weapons, and no one cares about it. We know what the Argentines are up to: they are building a reprocessing facility, showing it on TV, announcing their intention to sell plutonium, and nobody minds. There is total apathy and what I would call a shocking sense of responsibility on the part of the industrialized countries."

Of all the non-nuclear-weapons powers, Argentina is incontrovertibly the most advanced in its nuclear program, that is, it has long experience, a wealth of knowledge and know-how, various installations in full operation and driving ambitions.

Last year a BBC documentary revealed how it all started. Even some time before the end of World War II, a group of German industrialists were concerned about what would become of the Nazi technology in the event of defeat. A plan was forged to transfer strategic knowledge to a new fatherland: Argentina. In this illustrious company, there were officers of I.G. Farben, producer of, among other things, poison gas for the concentration camps and heavy water.

I.G. Farben later acted as the organizer of the great migration. In addition to Argentina, Paraguay and Brazil were selected as destinations. The Argentine colonel, Juan Peron, and his likewise well-known wife Evita could put the Germans to good use for the development of a modern (nuclear) industry. It was incidental that some Nazis were dreaming more of a new German Reich.

Dr Walter Schnurr in particular was of incalculable value for Peron. He was nicknamed the "pope of high explosives." Under Hitler, Schnurr had been the director of the I.G. Farben explosives factory in Christianstadt. Schnurr devoted his talents to Argentina's nuclear program for 10 years. He unexpectedly returned to Germany in 1955 at the invitation of Franz Joseph Strauss, then minister of energy.

At a distance, Schnurr indeed seems to be the one who was most helpful to the Argentines. As science director of the nuclear research center in Karlsruhe, he helped get started the German "peaceful nuclear program." This program also eventually looked after export. One of the buyers was Argentina.

Kraftwerk Union (KWU), a subsidiary of Siemens, built Latin America's first nuclear reactor, the Atucha I, not far from Buenos Aires. From this moment on, the Netherlands can no longer plead innocent. RSV's department of heavy-equipment manufacture supplied the components for Atucha's reactor vat. Operating on natural uranium and heavy water, the nuclear power plant has been on line since 1974.

The Argentines had been very interested in the reprocessing technology since the early 1970s. Through this process, the waste material of nuclear power plants can be made to yield plutonium, the major ingredient in the Bomb. The Germans assisted Argentina with a pilot installation that easily produced a kilo of plutonium. Officially, it was intended for "study purposes."

And thus this German-Argentine cooperation could bear its most bitter fruit this year or the next: the Ezeiza reprocessing facility, the first of its kind in Argentina, with a capacity to produce 20 tons of radioactive fissionable material annually--enough for almost one atomic bomb per month.

\* \* \*

At the Dutch Ministry of Foreign Affairs, the department for nonproliferation questions plays down the nuclear weapons aspirations of the Argentines. A spokesman assures us: "If we were to name all the safeguards and agreements that Argentina has entered into with the IAEA, it would make a long list. Everything that is finished and of any importance is subject to special inspection regulations."

Reporter: There is the general criticism that the inspection policy has some drawbacks.

Answer: Naturally that is easy to say, isn't it?

Reporter: Especially in countries having little political willingness to be inspected.

Answer: You shouldn't look for all kinds of sinister intentions behind it.

The spokesman admitted that the Argentines were acting on the quid pro quo principle: "They gratefully accept safeguards in practice, if they can get a nuclear reactor for it." He likewise confirmed that Argentina has fairly mastered the complete heavy-water cycle, having no need of enriched uranium from outside. "You can hardly keep track of this process. In the long run, they will doubtlessly be able to run the full nuclear cycle."

Reporter: But you know that the Argentines have a strong military bent. They are the most advanced in Latin America, whereas they don't have to do it to generate energy.

Answer: Oh, what do you mean?

Reporter: More than 90 percent of their oil comes out of their own ground.

Answer: I don't know much about that. I can imagine that prestige plays a role along with energy considerations, plus the idea of having a technology that can spearhead the advance of other industrial sectors. Castro Madero [chairman of the National Atomic Energy Commission and Argentina's foremost proponent of this subject--the writers] might say

that the Argentines could certainly make a bomb, but recently he added that that is the most stupid way to spend money and that they don't have any plans to do it.

We understand that all that talk must be viewed as more than a threat. The ministry of foreign affairs assumed the same mild interpretation of the Argentine refusal to abandon the option for "peaceful nuclear explosions." This is intended simply to gain maximum room for negotiating with the rich countries with nuclear know-how.

Professor Frank Barnaby holds a completely different opinion: "I am not convinced of the sense of international inspection. How effective is it in the case of Argentina? And how do you do it now that the Argentines are building a recycling facility that does not fall under the IAEA safeguards? Plus broadcasting their intention to sell plutonium? The whole inspection program is merely intended to enable the exporting countries to claim that their exports are in good order. It is an excuse. And it fails with countries like Argentina whose nuclear energy program is partially motivated by the weapons option."

\* \* \*

The nuclear construction industry is very active in Argentina. Near Arroyito, the finishing touches are being put to an extensive heavy-water facility, supplied by the Swiss firm Sulzer. The nuclear power plants Embalse Rio Tercero and Atucha II are expected to go on line in 1984 and 1987. According to some sources, the Ezeiza reprocessing facility has been operational since 1979 but has not yet produced any plutonium as far as we know. The heavy-water facility near Arroyito will supply fuel for Atucha I for the time being. This "German" power plant was built according to a design that was already obsolete even then, but it had one very striking feature: together with a reprocessing facility, it was especially suited for producing plutonium. The United States used identical models for the same purpose.

Once again, the Netherlands has the honor of participating in this. Foxboro Nederland NV, subsidiary of the American multinational of the same name, delivered a Spectrum to Argentina 6 months ago. That is a computer-operated cybernetic system that is an essential component of the heavy-water facility. Its value is three million guilders. "Not a small order, but with yearly sales of 180 million guilders we didn't really turn somersaults over it," says J. Wallenburg, general director of Foxboro Nederland.

Machines such as Spectrum appear on the list of strategic goods for whose export a permit has always been required. Whoever might think that efficient and sound procedures are followed for this will be disappointed. Although Foxboro frequently supplies the nuclear industry, they simply did not apply for a permit at first. The Ministry of Economic Affairs, stirred by newspaper reports, had to call up the company management about it. Only then did Foxboro hurriedly send an application to Groningen, where the National Import-Export Office is located.

The (confidential) cover letter for the application, dated 26 July 1982, carries a rather apologetic tone: "There has never been any secrecy concerning this project." And then there is the line: "It was prematurely publicized in the press." As though Foxboro had sought this publicity on its own and had thus met any legal obligation! Wallenburg generously admitted the mistake--of course, after the Spectrum was already in Argentina: "Some dumb fellow in the company here said that we didn't need any kind of export permit. It was a blunder, any way you look at it. Hell, we need a permit for everything we export."

Beforehand, there was some delay, for usually publicity quickly makes the bureaucrats in Groningen uneasy. The hot potato was passed on to the capital and remained there until Wallenburg himself intervened. He personally approached State Secretary Dik (export administration). The matter then received prompt attention.

The export permit was granted because the heavy-water facility at Arroyito is subject to a safeguard agreement. When a country is not a signatory of the Nonproliferation Treaty (Argentina is not), an agreement can be made by project with the International Atomic Energy Agency in Vienna. "That is the commission that checks that it is not being used for those little old atomic bombs," says Wallenburg. "They come around regularly, checking on what mischief they are up to with the thing." It is at least interesting to hear what a practical man of the world like Wallenburg thinks if the IAEA inspection.

Reporter: Is a separate agreement just as effective as when a country has signed the Nonproliferation Treaty?

Wallenburg: Just as ineffective, if you ask me. Many countries are honoring it, but just as many are not.

Reporter: No distinction can be drawn at all?

Wallenburg: No, not in my opinion.

\* \* \*

In the Netherlands, the Foxboro order has hardly caused a sensation. But it did in the United States. The American Foxboro supplied Spectrum components to its Dutch branch and obtained a special permit for their export. This directly conflicted with the U.S. policy of not selling any "sensitive" materials to countries that have not signed the Nonproliferation Treaty, a policy very strictly enforced under Carter.

The American decision was especially puzzling when at the same time Masoneilan International was refused a permit to supply the valves for the same heavy-water facility, valves that were to be operated by Foxboro Spectrum. The single difference between the two transactions was critical for the Americans: the Foxboro order was to go by way of the Netherlands, whereas the Masoneilan order was to be shipped directly to Argentina. This was going a little too far.



As a result of the discussions, the Americans have meanwhile regained interest in the Foxboro adventure. Since the end of February, a ban on export to Argentina has been in effect for "critical" materials. The one single slip-up seems to have been a kind of gesture. Just after the Malvinas war, American prestige was fairly battered in Latin American and especially in Argentina. Besides this, the Argentines were doing more and more business with the Russians, even for things nuclear. Nothing can be as bad as that, and Big Brother gave them what they wanted. The Netherlands went along obediently.

The Malvinas war had consequences of another kind too. The Argentines were incensed that England could unabashedly have nuclear subs cruising Latin American waters. Thus, Argentina also had the right to make military applications of nuclear energy, declared retired Vice Admiral Castro Madero. he was mounting one of countless attacks against the Nonproliferation Treaty, which in the eyes of the Argentines discriminates in numerous ways against the non-nuclear-weapons powers. "Disarmament for the disarmed," was the Argentine judgment of the treaty.

Indeed, it is a remarkable fact that the treaty partners can use material and facilities for "nonproscribed military activities" (primarily nuclear subs), whereas any military use is proscribed for countries under separate IAEA agreements. The Argentines do not mind this much, though. An official study is underway there on the feasibility of having their own nuclear subs. The Dutch government does not regard this as a military use of nuclear energy.

\* \* \*

"The whole thing is a mess," Professor Frank Barnaby explained. "Anarchy. The Western nuclear industries are locked in a venomous struggle to survive, and export is the key to survival. Alas, the Third World is the best market to develop. And so you are seeing a violent crush there. The result is that you're spreading the ability to produce nuclear weapons. The more nuclear states there are, the greater are the chances of a global nuclear war. You would hope that the industrial countries would sit down together and agree to regulate their nuclear export. But they don't. It is a terrible danger, a danger that nobody is trying to counter."

According to Barnaby, the Bomb is technically within Argentina's reach. The political impediments are not great, either. The Treaty of Tlatelolco, banning the spread of nuclear weapons in Latin America, was not ratified by Argentina. The IAEA inspection is valid for a project in process and can be simply terminated after the project completion. Added to this, Argentina is able independently to erect reactors with the technology and knowledge it has been gathering bit by bit.

Already now, Argentina is supplying uranium to Israel. The country has nuclear exchange programs with India and Peru. For years a rumor has been circulating about a secret agreement for cooperation with Libya. It is said that "contacts" have been established with South Africa, too.

Whenever Argentina begins to produce plutonium, it is assured of a keen international interest. Men like Qaddafi are literally wringing their hands to get some. But there are many other clients in line, too. "Terrorist groups, liberation organizations, even criminals are after plutonium," says Barnaby. "Argentina is a prime example of a country that would gladly sell the stuff. One cannot assume that they will feel the same scruples as the Americans about selling it."

Perhaps the elections in Argentina, announced for the end of October, will bring about a change in policy. For 10 "missing" Argentine nuclear scientists--"missing" because they criticized the regime--the elections come too late in any case.

9992

CSO: 5100/2593



EMBALSE NUCLEAR PLANT STARTS OPERATION 25 APR

Operation Started

PY252349 Buenos Aires NOTICIAS ARGENTINAS in Spanish 1700 GMT 25 Apr 83

[Text] Buenos Aires--The Embalse nuclear powerplant, located in Embalse Rio Tercero, Cordoba Province, started operations today and joined the national interconnected power system. The information was furnished here by the press office of the National Atomic Energy Commission [CNEA].

The ceremony, which took place at 1000, was attended by CNEA Chairman Rear Adm Carlos Castro Madero, who is due back in Buenos Aires today at 1700.

Official Inauguration 3 May

PY211255 Buenos Aires BUENOS AIRES HERALD in English 21 Apr 83 p 9

[Text] The new "Embalse" nuclear power station will be officially inaugurated in this province on May 3, National Atomic Energy Commission (CNEA) president, Rear Admiral Carlos Castro Madero, announced here yesterday. The Embalse station will be hooked up to the national power grid "for the improvement of electrical services throughout the country," he said.

Budgetary conditions, he explained, have caused the postponement for 21 months of the construction of the Atucha II power station and for one year of the projected heavy water plant. Castro Madero also said he had met with several atomic energy experts within several political parties, with whom, he said "I talked about the CNEA's plans for the future, as well as its policies" adding that "we are preparing a report to give the constitutional authorities who come into office (next year) the most complete information."

CSO: 5100/2055

BRIEFS

CNEA CHAIRMAN--[Question] Does Argentina plan to build a nuclear submarine?  
[Answer] Building a nuclear submarine is a long-range project that will call for a significant investment. The Argentine people would have to decide, through their representatives to the congress, whether this project would benefit the country. The CNEA is carrying out a feasibility study to determine whether the submarine could be built with Argentine technology. [Undated interview with Carlos Castro Madero, chairman of the National Atomic Energy Commission [CNEA], upon returning from Lima, Peru at Ezeiza Airport in Buenos Aires--recorded] [Excerpt] [PY151912 Buenos Aires Domestic Service in Spanish 1600 GMT 15 Apr 83]

CSO: 5100/2055

## BRAZIL

### TEXT OF NUCLEBRAS ANNUAL REPORT FOR 1982

Brasilia CORREIO BRAZILIENSE in Portuguese 12 Apr 83 pp 8-9

[Text] Brazilian Nuclear Corporation (NUCLEBRAS)

Annual report of the executive board for fiscal year 1982.

#### 1. Introduction

Fiscal year 1982 was marked, among other things, by the following accomplishments:

- Inauguration of the Pocos de Caldas Plateau [Planalto] mining-industrial complex;
- Inauguration of the fuel elements factory in Resende;
- Increase of the uranium reserves by 35,190 metric tons of  $U_3O_8$  as a result of the continuation of evaluation work in Lagoa Real and Itataia;
- Beginning of the assembly of the metallic containment sphere of the Angra-2 reactor building;
- Conclusion of bidding for execution of the civil construction of Angra-3;
- Signing of an agreement with the Peruibe city government for the development of projects pertaining to the infrastructure of the region.

#### 2. Mineral Prospecting and Exploration

Owing to the importance of the uranium-bearing districts of Lagoa Real and Itataia, during 1982 priority was given to the work of evaluating the two deposits.

The estimated uranium reserves in Brazil went from 266,300 tons in 1981 to 301,490 tons. The principal reserves are: Itataia with 142,500 tons, Lagoa Real with 93,190 tons and Pocos de Caldas with 26,800 tons.

### 3. Mineral Engineering

The mineral engineering area presented the following results:

- Execution of conceptual engineering for the Itataia pilot plant and bidding to contract the national engineering company that will be responsible for the executive project and construction of that unit;
- Preparation of preliminary studies of mining for the Lagoa Real project and bidding on the underground mining work complementing the investigation of irregularities;
- Development of the processing study of Torta-2 for the recovery of uranium, thorium and rare earths.

### 4. Industrial Activities

#### 4.1. Production of Heavy Minerals

The Nuclebras Monazite and Associated Minerals Corporation (NUCLEMON) continued exploiting the existing deposits and processing the heavy minerals such as, ilmenite, monazite, zirconite, rutile and sodium compounds.

The revenues from the sale of products to third parties exceeded 2 billion cruzeiros. Exports amounted to about \$340,000.

#### 4.2. Pocos de Caldas Plateau Mining-Industrial Complex (CIPC)

On 6 May 1982, NUCLEBRAS inaugurated the Pocos de Caldas Plateau Mining-Industrial Complex, the first in Brazil to produce uranium concentrate ("yellow-cake").

The uranium concentrate plant, which operates next to the Osamu Utsumi mine, has a nominal capacity of 500 tons a day of  $U_3O_8$ . Production this year was 285.55 tons, exceeding the original estimate of 246.2 tons.

#### 4.3. Resende Industrial Complex

The activities of the nuclear fuel cycle pertaining to the phases of conversion, isotopic enrichment and manufacture of fuel elements are carried out in the Resende industrial complex in the state of Rio de Janeiro.

##### 4.3.1. Conversion Plant

The principal activities carried out in the conversion plant were: Conclusion of the basic project of complementation services and grading services, and beginning of detail engineering.

##### 4.3.2. Separation Elements Factory

In the course of the installation of the separation elements factory, the following activities are noteworthy: Conclusion of the basic project, beginning of orders for machinery and equipment, and training of the first team of operators in the Federal Republic of Germany (FRG).

##### 4.3.3. Isotopic Enrichment Plant

The Nuclebras Isotopic Enrichment Corporation (NUCLEI) continued the construction and assembly of the first phase of the isotopic enrichment plant, called the first cascade and began project activities pertaining to the first extension (DEMO-1) of that plant.

In the first cascade, the "clean conditions" necessary to begin mechanical installation were obtained. Progress of 63, 40, 70 and 29 percent was achieved in the installation of equipment, piping, electrical work and instrumentation, respectively.

##### 4.3.4. Fuel Elements Factory

The following events should be noted:

- Actual beginning of production in July 1982 and completion of the manufacture of the 40 fuel elements for the first recharge of Angra-1;

- Official inauguration of the first stage of the fuel elements factory on 20 October 1982;

- Completion of the basic and detail plans of the second and third stages.

#### 4.4. Heavy Equipment Factory

The Nuclebras Heavy Equipment Corporation (NUCLEP) began the infrastructure work of the X-ray building, completed construction of the maritime terminal and began assembling the wet-jet cabin in complementation of the installation of the factory.

With regard to the operation, it began the manufacture of accumulators and condensers for Angra-2.

It proceeded with the manufacture of the following components: pressurizer (Angra-3); pressure and steam generator (Iguape-1) and pressure vessel (Atucha-2).

#### 5. Reprocessing Pilot Plant

The most noteworthy aspects of this enterprise were:

- Signing of the new engineering contract between NUCLEBRAS and the UHDE and INTER-UHDE companies; development in the FRG (UHDE) and in Brazil (INTER-UHDE) of detail engineering; continuation of the process of transfer of technology between NUCLEBRAS and the KEWA-UHDE consortium, and the signing of the contract for the supplying of imported equipment with the UHDE company.

#### 6. Science and Technology-Experimental Development

The principal activities carried out by the Nuclear Technology Development Center (CDTN) in the area of the transfer of technology and support for the NUCLEBRAS units were the following:

- Development of the process of physical beneficiation and chemical treatment of the uranium-bearing ore of Itataia;
- Determination of the tools for machining and specification of machines for

the manufacture of mouthpieces of fuel elements;

- Site studies for the Iguape-1 and Iguape-2 nuclear power stations;
- Execution of the plan for the circuit of tests of reactor components;
- Preparation of reports for licensing of installations, and radiological protection and environmental monitoring programs of the nuclear installations in the fuel cycle;

- Studies of mixed fuels (U, Th) O<sub>2</sub> and of the feasibility of the use of thorium in pressurized water reactors (PWR).

## 7. Industrial Promotion

The industrial promotion program includes 354 companies prequalified by Nuclebras Engineering Corporation (NUCLEN) 286 of which have been considered qualified to supply the various levels of quality required.

Up to 31 December 1982, 31 contracts for the transfer of technology were signed with foreign companies by NUCLEN and Brazilian manufacturers.

## 8. Power Plant Operation Simulator

In September 1982, manufacture of the operation simulator was completed in France; it was transported to and temporarily installed in the FRG and the training of its operators begun.

NUCLEBRAS was contracted to train operators of the Spanish TRILLO power station in 1983. This contract is worth \$200,000.

## 9. Education of Human Resources

For the education and training of personnel at home and abroad, NUCLEBRAS had the participation of other organizations, such as PLANFAP, PRONUCLEAR, the National Industrial Apprenticeship Service (SENAI), the Federal University of Rio de Janeiro-Coordinator of Post-graduate Engineering Programs (UFRJ-COPPE), IAEA and the UNDP.

In 1982, 570 technicians were trained in Brazil and 62 abroad, making an accrued total of 2,499 and 598, respectively.

#### 10. Nuclear Power Stations

With reference to the construction of nuclear power stations, the following activities are noteworthy:

##### 10.1. Angra-2

Beginning of the assembly of the metallic containment sphere, of construction of the buildings for the turbine, reactor control and auxiliary, and of the foundations for the water intake structure.

Completion of the first phase of the protection dams in front of the water intakes of the plants.

Signing of 69 contracts and contractual supplements with the national industry for the supply of equipment in the amount of \$107,937,700.

##### 10.2. Angra-3

Conclusion of bidding for the civil construction.

Completion of preparation of the area where the plant will be built.

Signing of 33 contracts and contractual supplements with the national industry for the supply of equipment in the amount of \$107,937,700.

##### 10.3. Iguape

Signing of an agreement with the Peruibe city government for execution of the engineering projects to improve the infrastructure of the municipality.

Construction of two bridges and purchase of a barge and tug for access to the site of the future plants.

Construction of the transmission line for supplying power to the project site.



#### 10.4 Project Engineering

Among the engineering activities of Angra-2, 60 percent of the super-structure project of all of the plant buildings was executed.

Proceeding with the development of the mechanical project, the basic project of the auxiliary nuclear systems of Angra-2 and Angra-3 were transferred to NUCLEN, increasing from 82 to 88 the number of systems under the responsibility of that subsidiary.

With reference to electrical engineering, 95 of the electric components, 75 percent of the communication, filling and lighting and 70 of the instrumentation and control were specified.

# FINANCIAL STATEMENT AS OF 31 DECEMBER 1982

## ASSETS

As of 31 December:	1982	1981
<b>CIRCULATING</b>		
Cash and banks	1,066,394	8,028,095
Financial applications	10,135,389	1,609,040
Accounts receivable	239,423	78,220
Costs of services and equipment underway to be recovered	-	12,879,711
Foreign currency deposits-BACEN Circular No 349	-	1,151,306
Taxes and benefits-Decree-Law 1994/82	4,527,323	-
Other credits	391,587	7,110,205
Stocks	20,861,005	4,512,073
Expenses of following fiscal year	<u>326,686</u>	<u>63,815</u>
	37,547,807	35,432,465
<b>LONG-TERM RECEIVABLE</b>		
Operations with companies of the group	53,940,525	24,595,873
Costs of services and equipment underway to be recovered	3,704,916	-
Advances to subsidiaries and associate for future increase of capital	10,216,153	4,063,973
Financing granted-FURNAS Electric Power Stations Corporation	296,573,841	76,362,518
Other credits	<u>10,802,574</u>	<u>790,800</u>
	375,238,009	105,813,164
<b>PERMANENT</b>		
Investments	39,346,258	11,177,189
Fixed	31,808,376	30,195,445
Deferred	<u>64,805,894</u>	<u>72,399,098</u>
	135,960,528	113,771,732
	<u>548,746,344</u>	<u>255,017,361</u>

(The explanatory notes are an integral part of the financial statements.)

# FINANCIAL STATEMENT AS OF 31 DECEMBER 1982

## LIABILITIES

As of 3 December:	1982	1981
CIRCULATING		
Suppliers (includes accounts with subsidiaries: 1982, 273,403 and 1981, 111,208 cruzeiros)	13,842,343	9,892,770
Financing and loans	24,941,697	9,777,625
Operations with companies of the group	24,448,919	43,814,068
Social and tax obligations	1,240,572	-
Provision for income tax	91,823	-
Provision for costs to be incurred	26,422,094	1,002,459
Other payables	<u>85,460</u>	<u>-</u>
	91,072,908	64,486,922
LONG-TERM PAYABLE		
Suppliers	7,385,967	3,093,342
Financing and loans	303,775,941	94,978,356
Federal credits for future increase of capital	5,358,342	-
Provision for income tax	14,870,724	1,982,157
Other payables (includes accounts with subsidiaries-1981, 711 cruzeiros)	<u>-</u>	<u>3,536,783</u>
	331,390,974	103,590,638
PROCEEDS OF FUTURE FISCAL YEARS		
Receipts of future fiscal years	78,839,812	-
Minus costs and expenses pertaining to receipts	<u>73,007,580</u>	<u>-</u>
	5,832,232	
NET ASSETS		
Authorized capital	94,029,369	12,094,137
Minus capital to be subscribed	<u>6,358,340</u>	<u>7,991,879</u>
Capital subscribed and integrated	87,671,029	4,102,258
Capital reserves	52,646,047	41,133,185
Profit reserves	296,478	149,915
Accrued losses	<u>(20,163,324)</u>	<u>92,627</u>
	120,450,230	45,477,985
FEDERAL CREDITS TO INCREASE CAPITAL	<u>-</u>	<u>41,461,816</u>
	548,746,344	255,017,361

Executive Directorate: Paulo Nogueira Batista, president, CPF:075,071,194-91;  
 Jose Pinto de Araujo Rabello, superintendent director, CPF: 290,227,387-87; John  
 Milne Albuquerque Forman, director, CPF: 030,922,917-00; Ney Freire de Oliveira  
 Junior, director, CPF: 006,428,788-20; Ilmar Penna Marinho Junior, director, CPF  
 021,253,317-72; Carlos Thadeu de Freitas Gomes, director, CPF: 036,473,587-20.  
 Accounting Department: Alex Borges Barreto, accountant, CRC-46,679-9-S-DF-533;  
 CPF: 363,500,367-00

STATEMENT OF PROCEEDS  
 [profit and loss]  
 (in 1,000 cruzeiros, as of 31 December 1982)

Sales of products	1,003,659
Services rendered	<u>83,408</u>
Operational gross revenue	1,087,067
<u>Minus:</u>	
Rebates and discounts	83
Taxes and assessments on sales and services	<u>162,238</u>
Operational net revenue	924,746
Cost of products sold and services rendered	<u>929,442</u>
Operational gross loss	4,696
Operational revenues	
Financial (deducted from financial expenditures of 192,436,284 cruzeiros)	2,822,940
Operational expenditures	
Administrative (includes 45,216 cruzeiros of administrators' remuneration)	7,787,750
Depreciations (deducted from 1,405,064 appropriated for cost of production)	179,261
Amortizations (deducted from 931,863 cruzeiros appropriated for cost of production)	9,922,388
Prospecting and exploration	4,932,044
Proceeds from appraisal of investments at asset value	<u>554,236</u>
	<u>20,552,739</u>
Operational loss	20,557,435
Nonoperational revenue	
Tax benefit (Decree-Law 1994/82)	3,983,212
Others	340,371

Nonoperational expenditures	3,725,298
Capital losses	143,788
Variation of percentage of participation in capital of the subsidiaries	243,568
Others	<u>210,929</u>
Net loss for the fiscal year	<u>20,346,506</u>
Loss per share of final capital	1.11 cruzeiros

(The explanatory notes are an integral part of the financial statements)

STATEMENT OF SOURCES AND APPLICATIONS OF FUNDS  
(in 1,000 cruzeiros)

Fiscal year ending 31 December:	1982	1981
SOURCES		
From stockholders		
Federal credits for future increase of capital	46,946,778	38,910,000
From third parties		
Subsidies for investments	1,221,896	333,759
Increase of long-term financing	88,341,849	37,735,295
Funds for formation of nuclear stocks-Law 5,876/73	-	154,351
Credits of subsidiaries and associate	-	2,510,807
Suppliers abroad	<u>5,295,107</u>	<u>3,093,342</u>
	141,805,628	82,737,554
APPLICATIONS		
In operations		
Net losses for fiscal year	20,345,506	-
Minus charges that do not represent outflow of funds:		
Depreciations and amortizations	10,101,649	-
Monetary variations on unreceived long-term debts	143,371,160	-
Other charges	695,550	-
Plus receipts that do not represent inflow of funds:		
Charges on financing granted to FURNAS Corp.	139,735,802	-

Monetary variations of operations with companies of the group	31,548,926	-
Monetary variations of advances to subsidiary companies and associate for future increase of capital	<u>4,610,550</u>	-
	42,073,425	-
In permanent assets		
Purchases of property from fixed assets	6,539,052	7,875,671
Increase of deferred assets	5,484,377	29,010,681
Increase of investments	17,864,633	7,340,757
For other purposes		
Increase of operations with companies in the group	1,500,642	-
Increase of advances to subsidiaries and associate for future increase of capital	1,600,082	1,848,217
Debtors by financing: third parties	75,860,687	53,881,982
Transfers to short term, of long-term loans, financing and suppliers	15,331,754	7,329,544
Increase of other long-term receivables	<u>21,620</u>	<u>741,602</u>
	<u>166,276,272</u>	<u>108,028,454</u>
Reduction of net circulating capital	(24,470,644)	(25,290,900)
	<u>Balances on</u>	<u>Reduction</u>
		<u>variation to</u>
	<u>31/12/82</u>	<u>31/12/81</u>
	<u>31/12/81</u>	<u>31/12/80</u>
	<u>31/12/82</u>	<u>31/12/81</u>
Circulating Assets	37,547,807	35,432,465
	4,682,947	2,115,342
	90,749,518	
Circulating Liabilities	<u>91,072,908</u>	<u>64,486,922</u>
	<u>8,446,504</u>	<u>26,585,988</u>
	<u>56,040,418</u>	
	(53,525,101)	(29,054,457)
	(3,763,557)	(24,470,644)
	(25,290,900)	

(The explanatory notes are an integral part of the financial statements)

# STATEMENT OF CHANGES IN NET ASSETS

(in 1,000 cruzeiros)

	Capital Reserves			
	Capital	Monetary correction of capital	Other monetary corrections	Subsidies for investment
Balances as of 31 December 1980	2,720,772	1,381,486	1,328,864	9,255,649
Funds for application in investments	-	-	-	333,759
Capital increases according to AGO of 23/04/82	1,381,486	(1,381,486)	-	-
Monetary correction	-	3,920,510	1,269,989	25,024,414
Balances as of 31 December 1981	4,102,258	3,920,510	2,598,853	34,613,822
Reduction of monetary correction of federal credits	-	-	(2,591,040)	(16,287,335)
Funds for application in investments	-	-	-	4,605,762
Tax incentives	-	-	-	2,133
Capital increase according to AGO of 23/04/82	3,904,521	(3,904,521)	-	-
Integration according to AGE of 13/12/82	79,664,250	-	-	-
Monetary correction	-	7,843,343	7,633	21,836,887
Net loss for the period	-	-	-	-
Balance as of 31 December 1982	87,671,029	7,859,332	15,446	44,771,269

(The explanatory notes are an integral part of the financial statements)

## STATEMENT OF CHANGES IN NET ASSETS

(in 1,000 cruzeiros)

	Profit Reserves				Total
	Legal	Development of nuclear technology program	Special from investments in subsidiaries and associate	Accrued profit (loss)	
Balances as of 31 December 1980	6,150	5,050	64,455	47,363	14,810,789
Funds for application in investments	-	-	-	-	333,759
Capital increases according to AGO of 23/04/82	-	-	-	-	-
Monetary correction	5,878	5,782	61,600	45,264	30,333,432
Balances as of 31 December 1981	12,028	11,832	126,055	92,627	45,477,985
Reduction of monetary correction of federal credits	-	-	-	-	(18,878,375)
Funds for application in investments	-	-	-	-	4,605,762
Tax incentives	-	-	-	-	2,133
Capital increase according to AGO of 23/04/82	-	-	-	-	-
Integration according to ACE of 13/12/82	-	-	-	-	79,664,250
Monetary correction	11,759	11,567	123,237	90,555	29,924,981
Net loss for the period	-	-	-	(20,346,506)	(20,346,506)
Balance as of 31 December 1982	23,787	23,399	249,292	(20,163,324)	120,450,230



## EXPLANATORY NOTES TO THE FINANCIAL STATEMENTS

### NOTE 1 - OPERATIONS:

The Brazilian Nuclear Corporations (NUCLEBRAS) is mixed-economy corporation established by the federal government under Laws Nos 5,740 of 1 December 1971 and 6,189 of 16 December 1974 as the executing agency of the federal monopoly in the nuclear energy sector.

NUCLEBRAS has been carrying out the following activities:

- a) mineral prospecting and exploration;
- b) production of uranium concentrate;
- c) development and installation of the conversion unit;
- d) manufacture of the fuel element;
- e) development of the reprocessing unit;
- f) supply of assets and equipment for construction of nucleo-electric plants;
- g) financing of the construction of nucleo-electric plants in accordance with Decree No 86,250 of 30 July 1981.

Until the fiscal year ending 31 December 1981, the company was in a pre-operational phase by virtue of the activities mentioned in items b), d) and f) not being at an industrial and commercial level.

The inauguration of the Pocos de Caldas Plateau mining-industrial complex (production of uranium concentrate) on 5 May 1982 and of the fuel elements factory on 20 October of that same year, as well as the beginning of the supplying of equipment for the nucleo-electric plants in Angra dos Reis caused the entrance into operations with the consequent verification of the results of the activities.

For these reasons, the Statement of Proceeds for the fiscal year is being presented for the first time.

NOTE 2 - SUMMARY OF PRINCIPAL ACCOUNTING PRACTICES:

The principal accounting practices adopted by the company in the preparation and presentation of the financial statements are as follows:

- System of accounting of transactions

The double-entry bookkeeping system is adopted to record the changes in assets that have occurred during the fiscal year.

- Separation of terms of receivables and payables

The assets receivable and liabilities payable for terms of up to 360 days are classified as circulating [current].

- Acknowledgment of inflationary effects

The effects of inflation on the financial statements are acknowledged by recording the monetary correction and exchange variation affecting the assets and liabilities susceptible of correction or of adjustment due to exchange variation.

The monetary correction of the permanent assets is limited to the amount of the monetary correction of the net assets as authorized by Article No 241 of Law 6,404/76. Accordingly, the amount of 58,444,828 (thousand) cruzeiros representing the excess amount was not added to the permanent assets and net assets.

- Standard of evaluation

- a) The financial applications in open market securities are entered at the purchase cost plus the proportional yield earned up to the date of the close of the fiscal year;
- b) Stocks are entered at the average purchase costs, which are less than market prices or net receivable. Imports underway are entered at the cost incurred up to the date of the statement;
- c) Investments arising out of corporate participations in the subsidiaries and the associate are evaluated by the method of asset equivalence;

The other investments are entered at the corrected cost;

- d) The "agio" pertaining to the investment in the associate NUSTEP GmbH & Co Kg. will have its form of amortization determined in the future on the completion of project that is now underway in charge of the associate;
- e) Fixed assets are entered at the corrected cost of purchase or construction. Depreciation is calculated by the linear method by the application of rates that take into account the useful economic life of the assets;
- f) The deferred assets are being amortized in a period of 5 years, beginning with this fiscal year, with the exception of the projects underway or being installed the costs of which continue to be deferred for future amortization to be initiated at the time of the entrance into operation of the respective units;
- g) The provision for income tax represents the amount of the tax calculated on the accrued inflationary profit taxation on which was deferred as authorized by legislation in effect.

NOTE 3 - CHANGE OF ACCOUNTING PRACTICE:

Until the previous fiscal year, the company adopted the practice of monetarily correcting the federal credits derived from budgetary grants and budgetary supplement granted by the Ministry of Mines and Energy through decrees of the federal government and intended for the future increase of capital, applying the official indices used for the monetary correction of the net assets. That monetary correction was entered to the account of subsidies for investments in the subgroup of capital reserves, as a counterpart to the deferred assets, and the ordinary mounts of credits were set off as a single item under the net assets.

In this fiscal year, the company no longer proceeded with the monetary correction of the aforementioned credits and instead classified them in the long-term payable group.

As a result of that, the following adjustments were made in the financial statements:

a) Cross-entry from the accrued balance as of 31 December 1981 of the monetary correction entered to the account of "subsidies for investments" (Capital Reserve) and the account of "monetary correction of permanent assets and net assets"

(Deferred Assets) in the amount of: (1,000 cruzeiros) 18,828,375

b) Entry of the income tax on the balance of the monetary correction cross-entered, as follows:

Circulating liabilities 91,823

Long-term payable 17,349,158

NOTE 4 - STOCKS	1982 (1,000 cruzeiros)	1981
Production in process--finished yellow-cake	776,248	-
Production in process--fuel element	2,904,840	-
Raw materials	652,086	873
Indirect material--national	393,524	105,836
Indirect material--imported	57,910	378,867
Material being beneficiated abroad	15,265,727	3,642,702
Stored	669,335	286,489
Imports underway	<u>141,335</u>	<u>97,306</u>
	20,861,005	4,512,073

The materials being beneficiated abroad are represented by 355,109 Kg of U<sub>3</sub>O<sub>8</sub>, 200,798 kg of UF<sub>6</sub> and 39,863.7 Kg of enriched uranium.

NOTE 5 - OPERATIONS WITH COMPANIES OF THE GROUP:

	1982	(1,000 cruzeiros)	1981	
	<u>Long-term receivable</u>	<u>Current liabilities</u>	<u>Long-term receivable</u>	<u>Current liabilities</u>
NUCLAM	1,027,877	-	511,594	-
NUCLEI	22,085,830	-	8,298,570	-
NUCLEN	3,792,964	868,785	2,485,148	93,294
NUCLEP	26,740,419	-	13,262,256	1,245,860
NUCLEMON	277,861	-	38,305	6,982
NUCON	<u>15,574</u>	<u>23,580,134</u>	<u>-</u>	<u>42,467,932</u>
	53,940,525	24,448,919	24,595,873	43,814,068

The amounts receivable and payable shown above represent operations of releasing funds supplying goods and services, reimbursable expenses the balances of which are remunerable at the average rate of acquisition in the market as provided in the respective exchange contracts.

NOTE 6 - FINANCING GRANTED--FURNAS ELECTRIC POWER STATIONS CORPORATION

This is intended to fully finance the contracts for over-all contracting and supplying nuclear fuel for Units-2 and 3 of the Almirante Alvaro Alberto Nuclear Power Station signed between FURNAS and the Nuclebras Nuclear Power Station Construction Corporation (NUCON) on 31 July 1981, according to Decree No 86,250 of 30 July 1981.

The financing granted yield semiannual and quarterly interests, respectively, calculated "pro rata tempore" on the debit balances corrected by the application of weighted average rates equivalent to the cost of acquisition of the funds (portion of funds of third parties) and at the rate of 12 percent per annum (portion of own resources).

The monetary correction is calculated on the debit balance and on the amortizations made through the application of average factors weighted by correction equivalent to the cost of acquisition of the funds (portion of third parties) and by the variation of the value of the National Treasury Readjustable Bonds (ORTN's) (portion of own funds).

The balances will be amortized in 20 semiannual installments and in 12 quarterly installments, respectively, due consecutively 6 months after the date of acceptance and taking possession of each of the units of the nuclear power station.

All the financing granted is guaranteed by letters of guarantee signed by the Brazilian Electric Power Stations Corporation (ELETROBRAS) in the over-all amount of 401,958,230,000 cruzeiros, readjustable.

NOTE 7 - INVESTMENTS	<u>1982</u>	(1,000 cruzeiros)	<u>1981</u>
Corporate participations in subsidiaries	37,619,911		10,487,521
Agio in associate	1,285,918		650,230
Other investments	<u>440,429</u>		<u>39,438</u>
	39,346,258		11,177,189

a) Composition in 1982 of investments in subsidiaries and outstanding in the associate:

	(1,000 cruzeiros)						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
NUCLAM (1)	51.00	31.12	521,189	-	383,328	(97,522)	265,806
NUCLEI (2)	75.00	31.12	12,569,955	-	9,432,122	(4,656)	9,427,466
NUCLÉN	75.00	31.12	(372,158)	-	-	-	-
NUCLEP	95.02	31.12	27,248,782	(143,788)	27,611,715	(1,576,134)	25,891,793
NUCLEMON	99.99	31.12	812,062	-	910,770	(98,789)	811,981
NUCON	100.00	31.12	1,222,865	-	-	1,222,865	1,222,865
NUSTEP OmbH & Co Kg	50.00	30.09	(845,748)	-	-	(594,236)	37,619,911
				(143,788)	38,317,935	(594,236)	37,619,911

[1] Percentage of participation; [2] Net asset: base date; [3] Net asset: value; [4] Adjustment derived from variation of percentage of participation in the capital of subsidiaries; [5] Corrected cost of investment; [6] Asset equivalence adjustment; [7] Asset value of investment

(1) In preoperational phase

(2) In installation phase

The financial statements of the subsidiaries were examined by independent auditors.

b. Additional information:	NUCLAN	NUCLEX	NUCLN	NUCLER	NUCLEXON	NUCON	NUSTEL
Capital realized	364,285	9,781,308	175,507	22,000,000	340,485	770,000	8,422
Number of shares/quotas held	185,785	7,335,981	131,630	20,904,498	340,451	77	576
Type of shares	ON	ON	ON	ON	Quotas	ON/OF	Quotas
Profit (loss) for fiscal year	-	-	917,884	(2,204,055)	98,801	1,565,603	854,171
Accounts receivable	191,220	-	1,630,022	1,976,681	-	-	-
Accounts payable	-	-	1,142,188	-	-	23,580,134	-
Loans granted	1,027,877	22,085,830	2,162,942	24,763,738	277,861	23,580,134	-
Advances to increase capital	811,955	-	129,709	-	175,529	5,696,560	3,402,410
Revenue	925,860	12,619,497	1,791,669	16,965,014	101,160	3,539,516	1,576,191



## NOTE 8 - FIXED ASSETS

	1982 (1,000 cruzeiros)		1981
	Corrected cost	Corrected depreciations and amortizations	Net value
Land	1,337,860	-	1,337,860
Buildings	7,292,319	(320,122)	6,972,197
Machinery and equipment	15,180,563	(1,457,902)	13,722,661
Vehicles	179,305	(93,615)	85,690
Furniture and fixtures	634,968	(245,728)	389,240
Improvements in assets of third parties	<u>210,635</u> 24,835,650	<u>(147,692)</u> (2,265,059)	<u>62,943</u> 22,570,591
Imports underway	172,005	-	172,005
Projects underway	9,054,086	-	9,054,086
Other fixed assets	11,694	-	11,694
Current fixed assets	<u>-</u> <u>34,073,435</u>	<u>-</u> (2,265,059)	<u>-</u> <u>31,808,376</u>
			<u>3,492,819</u> 30,195,445

## NOTE 9 - DEFERRED ASSETS

Expenditures with the uranium prospecting and exploration program	10,189,594	-	10,189,594	11,684,570
Expenditures with Pocos de Caldas project	34,665,831	(5,525,844)	29,139,987	15,117,352
Expenditures in obtaining technical information, consultation and training	13,024,581	(1,659,126)	11,365,455	8,779,226
Interest of loans and financing (minus that of active transactions)	21,746,050	(3,709,465)	18,036,585	13,704,782
Net monetary variations and monetary correction of permanent assets and net assets	(15,921,538)	4,042,093	(11,879,445)	6,038,199

Income tax on inflationary profit (includes reversion due to change of factor in the amount of 6,137,491 Cr)	7,299,558	(3,411,342)	3,888,216	1,990,717
Other expenditures (net of revenue) to be amortized	<u>5,448,826</u>	<u>(1,383,324)</u>	<u>4,064,502</u>	<u>15,084,252</u>
	76,452,902	(11,647,008)	64,805,894	72,399,098

NOTE 10 - FINANCING AND LOANS

	<u>(1,000 cruzeiros)</u>		<u>Annual rate</u>	<u>Last</u>
	<u>1982</u>	<u>1981</u>	<u>of charges</u>	<u>maturity</u>
In national currency:				
Various institutions	21,432,253	10,891,721	12% to 114.3%	1989
- short-term portion	<u>(11,785,636)</u>	<u>(4,358,094)</u>		
	9,646,617	6,533,627		
In foreign currency:				
U.S. dollar-\$662,011,000 (1981-\$396,881,000)	167,270,686	50,721,561	0.875 to 2.125% above LIBOR	1991
German Marks- DM 1,269,323,000 (1981-DM 736,127,000)	136,236,564	41,756,889	0.875 to 2.125% above LIBOR	1991
French Francs-FF 99,742 (1981-FF 61,799)	3,778,135	1,385,810	7.2 to 7.75%	1989
-short-term portion	<u>(13,156,061)</u>	<u>(5,419,531)</u>		
	294,129,324	88,444,729		
	303,775,941	94,978,356		

Guarantees:

The foreign currency loans are guaranteed in the greater part by the endorsement of the federal government.

NOTE 11 - CAPITAL:

The subscribed and integrated capital is represented by 10,774,299,879 nominative common and 7,566,919,561 bearer preferred shares with a value of 4.78 cruzeiros each (2.45 cruzeiros in 1981).

NOTE 12 - SUBSIDIES FOR INVESTMENTS:

These represent funds derived from the Single Tax on Liquid and Gas Lubricants and agreements to be applied in research and development activities in nuclear minerals and technology, in the establishment of nuclear fuel-cycle units, as well as grants received from the International Atomic Energy Agency for investments.

NOTE 13 - TAX BENEFIT- DECREE-LAW 1994/82:

The amount of 3,983,212,000 cruzeiros pertaining to this benefit is found entered in the category "Nonoperational Revenues" in counterpart to Circulating Assets and has as its source the increase of subscribed and integrated capital as of 30 December 1982 in the amount of 79,664,250,000 cruzeiros.

AUDITORS' REPORT

Honorable Directors of the  
Brazilian Nuclear Corporation (NUCLEBRAS)

1. We have examined the financial statement of the Brazilian Nuclear Corporation (NUCLEBRAS) prepared as of 31 December 1982 and the respective statements of proceeds, changes in net assets and sources and applications of funds for the fiscal year ending on that date. Our examination was made in accordance with generally accepted auditing standards and, accordingly, included examination of the accounting records and other auditing procedures we deemed necessary in the circumstances.

2. Previously, we examined and issued our report on the financial statement for the fiscal year ending on 31 December 1981, the figures of which are presented for purposes of comparison.

3. In our opinion, the financial statements referred to in the first paragraph fairly represent the assets and financial position of the Brazilian Nuclear Corporation (NUCLEBRAS) as of 31 December 1982 and the proceeds of its operations, the changes of its net assets and the sources and application of its funds for the fiscal year ending on that date, in conformity with generally accepted accounting principles applied in a manner consistent with the previous fiscal year with the exception of what is mentioned in Note 3 of the financial statements.

Rio de Janeiro, 11 February 1983; Boucinhas, Campos & Claro S/C, CRC. SP-5,528-S-RJ; Milton Claro, accountant, CRC-RJ-10,316-5

#### FISCAL BOARD REPORT

In accordance with the terms of current legislation and statutory provisions, the fiscal board of the Brazilian Nuclear Corporation (NUCLEBRAS) examined the annual report of the executive directorate on the activities of the firm, as well as the financial statements that include the statement of assets and liabilities, the statement of proceeds, the statement of changes in net assets, the statement on the sources and applications of funds, explanatory notes to the financial statements and the report of independent auditors, pertaining to the fiscal year ending 31 December 1982.

Based on the analysis undertaken, the fiscal board is of the opinion that the items examined fairly reflect the assets and financial situation of NUCLEBRAS and, therefore, recommends that the general assembly of stockholders fully approve it.

Rio de Janeiro, 18 February 1983; Paulo Cabral de Araujo, Nelso Farhat, Paulo Gustavo Migon.

BRAZILIAN NUCLEAR CORPORATIONS - NUCLEBRAS AND SUBSIDIARIES  
CONSOLIDATED FINANCIAL STATEMENT AS OF 31 DECEMBER 1982

ASSETS

As of 31 December:	1982	1981
CIRCULATING		
Cash and banks	1,311,873	8,790,926
Financial applications	10,151,357	1,837,795
Accounts receivable	1,707,294	561,298
Costs of services and equipment underway to be recovered	697,734	13,080,432
Foreign currency deposits-BACEN Circular No 349	-	1,290,535
Taxes and benefits--Decree-Law 1994/82	5,144,297	-
Other credits	1,693,452	1,314,274
Stocks	22,617,119	5,347,668
Expenses of following fiscal year	<u>336,636</u>	<u>68,904</u>
	43,659,762	32,291,832
LONG-TERM RECEIVABLE		
Advance to associate-NUSTEP	3,402,410	1,585,823
Financing granted-FURNAS Electric Power Stations Corporation	296,573,841	76,362,518
Costs of services and equipment underway to be recovered	2,811,646	681,080
Other credits	<u>11,102,782</u>	<u>235,734</u>
	313,890,679	78,865,155
PERMANENT		
Investments	1,745,062	699,575
Fixed	111,137,977	59,346,008
Deferred	<u>103,360,189</u>	<u>95,858,310</u>
	216,243,228	155,903,893
	<u>573,793,669</u>	<u>267,060,880</u>

(The explanatory notes are an integral part of the financial statements.)

CONSOLIDATED FINANCIAL STATEMENT AS OF 31 DECEMBER 1982

LIABILITIES

As of 31 December:	1982	1981
CIRCULATING		
Suppliers	25,563,322	13,802,905
Financing and loans	27,953,507	10,799,288
Social and tax obligations	2,974,873	1,353,805
Provision for income tax	91,823	-
Provision for costs to be incurred	32,620,346	38,468,980
Other payables	<u>3,259,229</u>	<u>1,022,186</u>
	92,463,100	65,447,164
LONG-TERM PAYABLE		
Suppliers	7,385,967	3,093,342
Financing and loans	328,600,371	103,257,908
Credit from shareholders for future increase of capital	6,138,456	-
Provision for income tax	15,064,972	2,109,731
Other payables	<u>500</u>	<u>4,394,840</u>
	357,190,266	112,855,821
PROCEEDS OF FUTURE FISCAL YEARS		
Revenue of future fiscal years	88,146,397	38,890,040
Minus: costs incurred and to be incurred	<u>78,756,436</u>	<u>38,780,100</u>
	9,389,961	109,940
SHARE OF MINORITY STOCKHOLDERS	<u>4,661,905</u>	<u>1,708,154</u>
NET ASSETS		
Authorized capital	94,029,369	12,094,137
Minus: capital to be subscribed	<u>6,358,340</u>	<u>7,991,879</u>
Subscribed and integrated capital	87,671,029	4,102,258
Capital reserve	52,646,047	41,133,185
Profit reserve	296,478	149,915
Accrued profits (losses)	<u>(30,525,117)</u>	<u>92,627</u>
	110,088,437	45,477,985
FEDERAL CREDITS FOR FUTURE INCREASE OF CAPITAL	<u>-</u>	<u>41,461,816</u>
	573,793,669	267,060,880

# CONSOLIDATED STATEMENT OF PROCEEDS

[profit and loss]

(in 1,000 cruzeiros, for fiscal year ending 31 December 1982)

Sales of products	33,199,563
Services rendered	<u>149,989</u>
Operational gross revenue	33,349,552
Minus:	
Rebates and discounts	1,624
Taxes and assessments on sales and services	<u>650,910</u>
Operational net revenue	32,697,018
Cost of products sold and services rendered	<u>30,787,113</u>
Operational gross profit	1,909,905
Operational revenues	7,945
Operational expenditures	
Administrative (includes 118,820 cruzeiros of administrators' remuneration)	10,740,398
Financial (deducted from financial revenues of 191,363,634 Cr)	35,655,149
Depreciations (deducted from 2,736,140 cruzeiros appropriated for the cost of production)	321,524
Amortizations (deducted from 931,863 cruzeiros appropriated for the cost of production)	10,490,769
Prospecting and exploration	<u>5,020,343</u>
Operational loss	60,310,333
Nonoperational proceeds	248,110
Monetary correction of permanent assets and net assets	(33,331,578)
Minority participation	<u>26,001</u>
Net loss for the fiscal year	27,252,866

(The explanatory notes are an integral part of the financial statements.)



# CONSOLIDATED STATEMENT OF SOURCES AND APPLICATIONS OF FUNDS

(in 1,000 cruzeiros)

Fiscal year ending 31 December: 1982 1981

## SOURCES

### From stockholders

Federal credits for future increase of capital	46,946,776	38,910,000
Credits from stockholders	106,329	858,568

### From third parties

Subsidies for investments	1,221,896	333,759
Increase of long-term financing	96,914,062	40,427,675
Integration of capital in kind	1,719,061	-
Funds for formation of nuclear stocks-Law 5,876/73	-	154,351
Increase of proceeds from future fiscal years	-	109,940
Suppliers abroad	5,295,107	3,093,342
Transfer from permanent assets to circulating assets	<u>5,592,235</u>	<u>-</u>
	157,795,466	83,887,635

## APPLICATIONS

### In operations

Net loss for the fiscal year	27,226,865	-
Minus charges that do not represent outflow of funds:		
Depreciations and amortizations	11,787,815	-
Monetary variations on unreceived long-term debts	150,031,246	-
Variations in proceeds of future fiscal year	2,564,168	-
Decreases of permanent assets	6,427,896	-
Plus receipts that do not represent inflow of funds:		
Charges on financing granted to FURNAS Corporation	139,735,802	-
Monetary variations of long-term receivables	1,723,126	-
Monetary correction of permanent assets and net assets	<u>33,331,578</u>	<u>-</u>
	31,206,246	-

### In permanent assets

Purchases of property from fixed assets	22,923,329	13,283,554
Increase of deferred assets	19,627,143	34,036,379
Increase of investments	368,502	27

For other purposes

Increase of advances to associate for future increase of capital	240,397	-
Debtors by financing: third parties	75,860,687	53,881,982
Transfers to short term, of long-term loans, financing and suppliers	17,978,621	7,994,464
Increase of other long-term receivables	2,890,620	892,990
Adjustments of previous fiscal years	2,347,927	-
	<u>173,443,472</u>	<u>110,089,396</u>
Reduction of net circulating capital	(15,648,006)	(26,201,761)

	<u>Balances on</u>			<u>Reduction</u>	
	<u>31/12/82</u>	<u>31/12/81</u>	<u>31/12/80</u>	<u>variation to</u>	
				<u>31/12/82</u>	<u>31/12/81</u>
Circulating Assets	43,659,762	32,291,832	6,489,359	11,367,930	25,802,473
Circulating Liabilities	<u>92,463,100</u> (48,803,338)	<u>65,447,164</u> (33,155,332)	<u>13,442,930</u> (6,953,571)	<u>27,015,936</u> (15,648,006)	<u>52,004,234</u> (26,201,761)

(The explanatory notes are an integral part of the financial statements.)

EXPLANATORY NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS

NOTE 1 - OPERATIONS:

The Brazilian Nuclear Corporations (NUCLEBRAS) (the parent company) is a mixed-economy corporation established by the federal government under Laws Nos 5,740 of 1 December 1971 and 6,189 of 16 December 1974 as the executing agency of the federal monopoly in the nuclear energy sector. [The remainder of the note is identical to Note 1 of the "Explanatory Notes to the Financial Statements."]

NOTE 2 - CONSOLIDATION PROCEDURES:

For purposes of consolidation, the following subsidiary companies were included in addition to the parent company:

	<u>Percentage of participation</u>		<u>Operational stage</u>	
	<u>1982</u>	<u>1981</u>	<u>1982</u>	<u>1981</u>
NUCLEP	95.02	88.66	In operation	In operation
NUCLEI	75	75	Being installed	Being installed
NUCLAM	51	51	Preoperation	Preoperation
NUCLEMON	99.99	99.99	In operation	In operation
NUCLEN	75	75	In operation	In operation
NUCON	100	100	In operation	In operation

Among the procedures adopted for the preparation of the consolidated financial statements, the following may be noted:

- a) Elimination of the balances receivable and payable among the companies included in the consolidation;
- b) Elimination of the revenues, expenditures and proceeds in the operations made between the companies;
- c) Elimination of the investments of NUCLEBRAS in the subsidiary companies against the portions corresponding to the net assets of those companies;
- d) Elimination of the proceeds from the evaluation of investments in the companies included in the consolidation, by the asset equivalence method.
- e) Indication of the participation of minority stockholders in the net assets of the subsidiary companies.

NOTE 3 - SUMMARY OF PRINCIPAL ACCOUNTING PRACTICES:

The principal accounting practices for the preparation of the consolidated financial statements are as follows:

- System of accounting of transactions

The double-entry bookkeeping system is adopted to record the changes in assets.

In the current stage of activities of the subsidiaries NUCLAM and NUCLEI, all costs and expenditures incurred and the revenues derived from possible activities are added to the deferred assets for acknowledgment in the proceeds of future fiscal years beginning with the entrance into normal operations.

- Presentation of the financial statement

The financial statement is prepared and presented in accordance with the provisions embodied in Law 6,404/76, and in pursuance also, as applicable, with the rules established by the Securities Commission (CVM).

- Separation of terms of receivables and payables

The assets receivable and liabilities payable for terms less than 360 days are classified as circulating.

- Acknowledgment of inflationary effects

The effects of inflation on the financial statements are acknowledged by recording the monetary correction and exchange variation affecting the assets and liabilities susceptible of correction or of adjustment due to exchange variation.

The monetary correction of the permanent assets (fixed and deferred) of the parent company is limited to the monetary correction of the net assets as authorized by Article No 241 of Law 6,404/78. Accordingly, the amount of 48,169,082 (thousand)

representing the excess amount was not added to the permanent assets and net assets.

- Standard of evaluation

- a) The financial applications in open market securities are entered at the purchase cost plus the proportional yield earned up to the date of the close of the fiscal year;
- b) Stocks are entered at the average purchase costs, which are less than market prices or net receivable. Imports underway are entered at the cost incurred up to the date of the statement;
- c) Fixed assets are entered at the corrected cost of purchase or construction. Depreciation is calculated by the linear method by the application of rates that take into account the useful economic life of the assets;
- d) The deferred assets are entered at the corrected cost; the bases of amortization of the deferred assets are detailed in Note 9;
- e) The proceeds of future fiscal years show the revenues of various kinds (services, equipment, etc) derived from billing to the contracting company reduced by the costs entailed in them, taking as a basis the cost/revenue ratio of services allocated to the proceeds of the fiscal year of the subsidiary NUCON and the estimate of the costs to be incurred.

NOTE 4 - CHANGE OF ACCOUNTING PRACTICE :

[This note is identical to Note 3 of the "Explanatory Notes to the Financial Statements."]

NOTE 5 - COST OF SERVICES AND EQUIPMENT UNDERWAY:

These are substantially represented by the expenditures incurred in the stages of contracting and importing services and equipment, at home and abroad, intended for Units 2 and 3 of the Almirante Alvaro Alberto nuclear power station.

NOTE 6 - STOCKS:	(1,000 cruzeiros) 1982	1981
Raw materials	957,086	147,062
Indirect material-national	393,524	105,836
Indirect material-imported	57,910	378,867
Material being beneficiated abroad	15,265,727	3,642,702
Products being processed	4,022,011	193,826
Finished products	213,246	161,400
Materials for industrial maintenance and consumption	212,887	146,248
Stored	1,286,345	427,741
Imports underway	141,335	97,306
Others	67,048	46,680
	22,617,119	5,347,668

The materials being beneficiated abroad are represented by 355,109 Kg of  $U_3O_8$ , 200,298 Kg of  $UF_6$  and 39,863.7 Kg of enriched uranium.

NOTE 7 - FINANCING GRANTED-FURNAS ELECTRIC POWER STATIONS CORPORATION:

[This note is identical to Note 6 of the "Explanatory Notes to the Financial Statements."]

NOTE 8 - FIXED ASSETS:

	1982 (1,000 cruzeiros)			1981
	Corrected cost	Corrected depreciations and amortizations	Net value	Net value
Land	6,512,488	-	6,512,488	3,604,722
Buildings	18,868,824	1,186,096	17,682,728	177,264
Machinery and equipment	36,268,073	4,080,226	32,187,847	7,114,131
Furniture and fixtures	1,540,459	504,130	1,036,329	575,589
Vehicles	510,947	254,748	256,199	102,534
Others	19,615	1,023	18,592	18,174
Improvements in assets of third parties	<u>255,469</u> 63,975,875	<u>164,962</u> 6,191,185	<u>90,507</u> 57,784,690	<u>5,299,393</u> 16,891,807
Imports underway	4,284,519	-	4,284,519	448,763
Projects underway	45,320,680	-	45,320,680	37,162,715
Other fixed assets	87,286	-	87,286	39,873
Advances to suppliers	3,613,523	-	3,613,523	1,260,524
Current net assets	<u>47,279</u>	<u>-</u>	<u>47,279</u>	<u>3,542,326</u>
	117,329,162	6,191,185	111,137,977	59,346,008

Under the items "projects underway" and "current assets" are entered the costs incurred in civil works, equipment, assembly, engineering services and others pertaining to the following industrial installations:

- Focos de Caldas industrial complex and fuel elements factory (NUCLEBRAS);
- Design and installation of the uranium enrichment demonstration plant using the centrifugal jet method (NUCLEI).

## NOTE 9 - DEFERRED ASSETS:

(in 1,000 cruzeiros)

	1982			1981
	NUCLEBRAS	NUCLEP	OTHERS	TOTAL
Expenditures with the uranium prospecting and exploration program	11,288,030	-	4,494,218	15,782,248
Expenditures with development of Pocos de Caldas deposit	38,403,448	-	-	38,403,448
Expenditures in obtaining technical information, consultation and training	14,429,070	5,296,005	245,018	19,170,093
Financial expenditures, monetary corrections and monetary variations-net	6,452,689	8,065,617	(9,005,787)	5,512,519
Income tax on inflationary profit (includes reversion due to change of factor in the amount of 6,137,491 Cr)	8,086,352	-	-	8,086,352
Improvements in assets of third parties	-	-	126,775	126,775
Costs not applied in production	-	6,312,716	-	6,312,716
Expenses of organization, administration and other expenditures (includes the losses of the subsidiary companies in operation-1,549,655 (thousand) cruzeiros in 1981)	4,986,585	10,889,264	7,500,019	23,375,868
	83,646,174	30,563,602	3,360,243	117,570,019
- accrued amortizations	(12,902,663)	(1,214,504)	(92,663)	(14,209,830)
	70,743,511	29,349,098	3,267,580	103,360,189
				(1,430,979)
				95,858,310



NOTE 10 - FINANCING AND LOANS:

	(1,000 cruzeiros) <u>1982</u>	<u>1981</u>	Rate of <u>charges</u>	Last <u>maturity</u>
In national currency:				
Various institutions	24,972,816	12,600,485	5.7% to 114.3%	1994
- short-term portions	(12,310,021)	4,664,768		
	<u>12,662,795</u>	<u>7,935,717</u>		
In foreign currency:				
U.S. dollar--\$674,123,000 (1981--\$406,273,000)	170,340,654	51,921,828	0.875 to 2.125% above LIBOR	1991
German Marks - DM 1,468,354,000 (1981--DM 848,625,000)	157,462,273	48,149,073	0.875 to 7.75% above LIBOR	1992
French Francs-- FF 99,742,000 (1981--FF 61,799,000)	3,778,135	1,385,810	7.2% to 7.75%	1989
- short-term portions	(15,643,486)	(6,134,520)		
	<u>315,937,576</u>	<u>95,322,191</u>		
	<u>328,600,371</u>	<u>103,257,908</u>		

The foreign currency loans are guaranteed in the greater part by the endorsement of the federal government.

The majority of the national loans were made through discounting promissory notes.

The loans of the Fund for Financing Machinery and Equipment (FINAME) are guaranteed by the fiduciary conveyance of the equipment purchased with the loan funds.

For the loans from the Studies and Plans Financing Fund (FINEP), NUCLEBRAS offered as a guarantee the quotas of the Single Tax on Lubricants and Liquid and Gas Fuels that are allocated to it by the federal government.

The criteria of amortization of the deferred assets are principally as follows:  
NUCLEBRAS

- Expenditures with the uranium prospecting and exploration program  
Amortization will begin when the respective units enter into operation.
- Other deferred assets  
Amortization is being effected on the basis of 20 percent per year.



## NUCLEP

The costs not applied in production will begin to be amortized only when the full utilization of the industrial facilities is achieved.

The other deferred expenditures are being amortized over a period of 10 years. Each portion of the annual amortization is being settled in proportion to the number of hours actually worked in the year in relation to the total number of hours estimated for those 10 years.

### NOTE 11 - CAPITAL:

The subscribed and integrated capital is represented by 10,774,299,879 nominative common and 7,566,919,561 bearer preferred shares with a value of 4.78 cruzeiros each (2.45 cruzeiros in 1981).

### NOTE 12 - SUBSIDIES FOR INVESTMENTS:

[This note is identical to Note 12 of the "Financial Statements."]

### NOTE 13 - TAX BENEFIT - DECREE-LAW 1994/82:

The amount of 5,144,297,000 cruzeiros pertaining to that benefit is found entered in the category "Nonoperational Revenues" in counterpart to the Circulating Assets and has as its source the increase of subscribed and integrated capital as of 30 December 1982 in the amount of 92,003,373,000 cruzeiros.

### NOTE 14 - NET ASSETS AND NET LOSS FOR THE FISCAL YEAR:

Following is a comparison of the net assets and net loss for the fiscal year for the parent company in relation to the consolidated net assets and net loss.

	(1,000 cruzeiros)	
	<u>Net loss</u>	<u>Net assets</u>
	1982	1981
Position of the parent company	20,346,506	120,450,230
Eliminations stemming from transactions among the subject companies in the consolidation, considered only for purposes of consolidation, as follows:		
Elimination of the portion of profits contained in the costs of services underway and in the cost of future fiscal years	3,001,543	(3,001,543)
Elimination of the financial revenue received by the parent company from the subsidiaries NUCLAM and NUCLEI	13,556,110	(13,556,110)

Elimination of the monetary correction from the investments of the subsidiary companies affected by the limitation of the monetary correction of the parent company	(30,275,746)	10,275,746
Adjustment of previous fiscal years pertaining to the profits contained in the costs of services underway and in the costs of future fiscal years	-	(2,291,161)
Transfers of the accrued losses of the subsidiary companies in operation in fiscal year 1981, classified in the deferred assets	-	(2,615,096)
Others	<u>624,453</u>	<u>826,371</u>
Position of the consolidation	27,252,866	110,088,437

#### AUDITORS' REPORT

Honorable Directors of the  
Brazilian Nuclear Corporation (NUCLEBRAS)

1. We have examined the consolidated financial statement of the Brazilian Nuclear Corporation (NUCLEBRAS) and subsidiaries prepared as of 31 December 1982 and the respective consolidated statements of proceeds and sources and applications of funds for the fiscal year ending on that date. Our examination was made in accordance with generally accepted auditing standards and, accordingly, included examination of the accounting records and other auditing procedures we deemed necessary in the circumstances.

2. Previously, we examined and issued our report on the consolidated financial statements of the fiscal year ending 31 December 1981, the figures of which are presented for purposes of comparison.

3. In our opinion, the consolidated financial statements referred to in the first paragraph fairly represent the assets and financial position of the Brazilian Nuclear Corporation (NUCLEBRAS) and subsidiaries as of 31 December 1982, and the proceeds of operations and the sources and applications of their funds for the fiscal year ending on that date, in conformity with generally accepted accounting principles. Those principles were applied in a manner consistent with the previous fiscal year with the exception of what is mentioned in Note 4 of the financial statements.

Rio de Janeiro, 23 March 1983; Boucinhas, Campos & Claro S/C, CRC. SP-5,528-S-RJ; Milton Claro, accountant, CRC-RJ-10,316-5

8711

ISC: 5100/2053

BRIEFS

ANGRA I OUTPUT--Licinio Seabra, president of Furnas Power Company, has reported in Rio de Janeiro that for the first time since the security test of its reactor was made, the Angra I nuclear powerplant yesterday reached 50 percent of its nominal output, that is, 280 megawatts. He said that now the powerplant will be disconnected again to await the arrival of the Westinghouse technical mission which is due to arrive in May to repair construction defects and to modify the two preheaters of the system. [Text] [PY230305 Sao Paulo O ESTADO DE SAO PAULO in Portuguese 16 Apr 83 p 1]

NUCLEAR CORPORATIONS DEFICIT--The deficit of the Brazilian Nuclear Corporations [NUCLEBRAS] last year amounted to 5.6 billion cruzeiros. This figure is the sum of the deficit shown on the balance sheet of only four of NUCLEBRAS' seven subsidiaries. [PY250054 Sao Paulo Radio Bandeirantes Network in Portuguese 1000 GMT 23 Apr 83 PY]

NONPEACEFUL NUCLEAR PROGRAM DENIED--Brasilia, 26 Apr (AFP)--Refuting newspaper reports that Brazil would be in the position to manufacture a nuclear bomb in 12 months, Brazil has denied that its nuclear program contemplates the manufacture of nuclear devices. Mines and Energy Minister Cesar Cals said that the Brazilian Government has already made the political decision of acquiring and developing technology only for peaceful ends. Minister Cals noted that Brazil wants to master nuclear technology for enriching and reprocessing uranium. Brazil is running against the interests of some countries. To avoid competition in an area in which the technology is expensive, they want to restrict its transfer, he added. These reports that Brazil will eventually manufacture a nuclear bomb originated in exclusive declarations of the FRG KWU Company (Kraftwerk Union) sales manager Gerold Herzog to JORNAL DO BRASIL. [Text] [PY270406 Paris AFP in Spanish 1530 GMT 26 Apr 83]

CSO: 5100/2057

## NONALIGNED MEETING ON NUCLEAR ENERGY HELD

## Meeting Opens in Havana

Havana GRANMA in Spanish 13 Apr 83 pp 1, 3

[Text] "We are certain that we shall think and act like members of a movement of countries which is manifesting itself as an instrument of peace, national liberation and economic development, and that we shall work untiringly to achieve strong, consistent cooperation." This statement was made yesterday by Jose R. Fernandez, vice president of the Council of Ministers and president of the Atomic Energy Commission of Cuba, at the opening of the Second Meeting of the Coordinating Countries in the Area of Peaceful Uses of Nuclear Energy of the Movement of Non-aligned Nations in our capital.

Elsewhere in his address, Fernandez remarked: "The current deepseated international economic crisis and the various critical problems stemming from it for our peoples, exacerbated by the history of colonial and neocolonial relations, have demonstrated how inevitable and necessary it is to develop other ties that will make it possible to eliminate the dependence, through diversification of the economic relations among our countries, making use of the potential that neocolonial subordination has prevented us from employing and that exists among us."

The Second Meeting, which is taking place at the Convention Palace, was opened by S.K. Singh, representing the president of the movement, Her Excellency, Indira Gandhi, who said that this meeting is the first formal one to be called since the recent summit conference in New Delhi, from which emanated the assignment to decide how the movement should react during the coming years in the area of peaceful uses of nuclear energy, one that signifies economic, scientific and technical development in the future, and peace and security today and forever.

He underscored the coincidence that the first meeting of nonaligned nations following the Seventh Summit should relate to the topic of nuclear energy, voicing his delight at the fact that, once again, "we are returning to the magnanimous previous site, Havana"; which is an indication of the continuity of this effort, "of which we are proud."

S.K. Singh urged the channeling of the discussions with the necessary calm, maturity and unity; and, on more than one occasion, he cited the crucial problem brought up in Fidel Castro's book on the current world economic crisis released at New Delhi conclave, to the effect that there is a need to establish cooperation among the movement's member nations.

Mr S. K. Singh, who is the Indian ambassador to the United Nations International Atomic Energy Agency, proposed to the plenary session the election, by acclamation, for the chairmanship of the Second Meeting, of "Dr Fidel Castro Diaz Balart, who is a prominent scientist," and this was immediately accepted.

Dr Fidel Castro Diaz Balart, who in brief remarks expressed appreciation for this appointment, is executive secretary of the Cuban Atomic Energy Commission and of the Executive Secretariat for Nuclear Affairs in our country, as well as chairman of our delegation to the function.

Jose R. Fernandez, in the opening speech, gave the official welcome to the representatives of the participating countries, and mentioned the honor for Cuba entailed in the holding of this conference in Havana.

He recalled the "young history" of the field of peaceful uses of nuclear energy in the Nonaligned Movement, which began after the Ministers Conference at Belgrade in July 1978; and he cited the Sixth Summit of the movement, held in the Cuban capital, at which there was recognition of the right of every country to devise programs and carry out its own nuclear development plan for these purposes.

The vice president of the Council of Ministers revealed the disadvantageous position of the countries with fewer resources and opportunities with respect to the option for contemporary energy development; which is shown by the very few numbers and very slight power of nuclear reactors put into operation in the underdeveloped world. He commented: "It is a fact that the surmounting of the centuries-old backwardness of the developing countries is being seriously hampered by their inability to generate, by themselves, the essential financial resources."

He emphasized the need to create different ties, as a consequence of this, stating: "At the present time, the cooperation among our countries is not an absurd attempt, but rather is based on needs felt by our peoples, on lessons gained from historical experience and on real, concrete possibilities for cooperation which exist."

He noted that this cooperation might be in the realm of productive, technological and commercial relations, stressing that the development of nuclear energy is the closest basic solution; despite which our countries' access to it has been delayed by the restrictions imposed by the countries exporting this technology, the relatively small size of the national electrical systems, the meager supply of qualified personnel and the high financing rate.

Officiating at the opening session of this event, among others, were Isidoro Malmierca, minister of foreign relations; Dr Wilfredo Torres, president of the Academy of Sciences of Cuba; and Ministers Joaquin Benavides, Jorge Fernandez Cuervo and Manuel Vila Sosa; as well as Vice Minister Manuel Aguilera, member of the Atomic Energy Commission.

Attending this Second Meeting are: Afghanistan, Angola, Algeria, Argentina, Benin, Congo, Cuba, Ecuador, Egypt, Ghana, Guyana, Indonesia, Iran, Iraq, Libya, Lao, Panama, Nicaragua, Nigeria, Guinea, Guinea-Bissau, Pakistan, Peru, Syria, Democratic People's Republic of Korea, Vietnam, Suriname and Yugoslavia. Present as observers are the UN, Mexico, Venezuela and the African National Congress.

## Afternoon Session

The function resumed its work sessions in the afternoon, with the election of Nigeria, Pakistan and Yugoslavia to occupy the three vice chairmanships at this Second Meeting, and of Argentina as rapporteur.

As the press was informed by Jorge Morales, spokesman for the event, approval was also given for the circulation of the address delivered by Jose R. Fernandez at the opening session, as an official document of the meeting.

The agenda was approved with a change in point number 6. The spokesman said that, after an extensive discussion, the proposal from the Cuban delegation to add a section relating to "other aspects associated with international cooperation" was accepted; something which will enhance the debate on this issue which is so important to the nations in the movement.

The rest of the afternoon session was devoted to the discussion of the report from the Ad Hoc Committee, headed by Argentina, regarding the proposals for cooperation in the area of peaceful uses of nuclear energy; a committee which had been created during the First Meeting of the Coordinating Countries.

During the evening, the Executive Secretariat for Nuclear Affairs gave a reception in honor of the delegations participating in the Second Meeting, which was attended by Jose R. Fernandez, Fidel Castro Diaz Balart, Foreign Minister Malmierca and Ministers Joaquin Benavides, chairman of the State Committee for Labor and Social Security, and Manuel Vila Sosa, of the Ministry of Domestic Trade, among other guests.

## Fernandez Speech at Opening

Havana GRANMA in Spanish 14 Apr 83 p 3

[Text] Speech delivered by Jose R. Fernandez, Vice President of the Council of Ministers and Chairman of the Atomic Energy Commission of Cuba, at the opening of the Second Meeting of the Coordinating Countries in the Area of Peaceful Uses of Nuclear Energy of the Movement of Nonaligned Nations, held at the Convention Palace in Havana, on 12 March 1983, "Year of the 30th Anniversary of Moncada" [as published

Members of the Chair;

Distinguished delegates and guests;

Comrades, male and female:

Permit me, in the name of the government of the Republic of Cuba, to offer you the most cordial welcome and to express the great honor that it represents for us to have this Second Meeting of the Coordinating Countries in the Area of the Peaceful Uses of Nuclear Energy of the Movement of Nonaligned Nations take place in Havana.

Be assured that we shall strive to provide the necessary facilities to enable this meeting to be a major step in the history of the cooperation among our peoples.



thereby fulfilling, to an increasing extent, the major responsibility assigned by the heads of state and government to the coordinating countries in this important area, at the recent Seventh Summit Conference of the Movement, held in New Delhi.

Confident of the success of the effort of all those present, based on the general interests of our peoples, and in accordance with the movement's principles, we place ourselves at your complete disposal in order to attain the significant, decisive goals that we have set for ourselves.

The area of peaceful uses of nuclear energy has a young history in the Movement of Nonaligned Nations. It began with the decision contained in Paragraph 29 of the Program of Action for Economic Cooperation approved at the Ministers Conference which took place in July 1978 at Belgrade, where the movement's countries were instructed to explore mutual cooperation in this field, forming the Group of Coordinating Countries in the Area which, months later, held its first preparatory meeting in the same city of Belgrade.

At that meeting, the results of which were reported to the Sixth Summit Conference of the Movement at Havana, recognition was given for every country's right to devise programs and carry out its own nuclear development plan for peaceful purposes, depending on its social and economic requirements; and emphasis was placed on the special significance of the cooperation between the nonaligned nations and other developing countries interested in the peaceful use of nuclear technology.

In order to fulfill this intention, it was recommended that there be an exploration of mutual cooperation among the interested countries in such fields as nuclear energy and its nuclear fuel cycle, nuclear raw materials, the use of research reactors, the production and application of radioisotopes and intense ionizing radiation sources.

At the next meeting of the Group of Coordinating Countries, held during June 1980 in Buenos Aires, a determination was made of the different areas of potential cooperation among the interested countries, as well as of various methods for carrying out such cooperation.

The Ad Hoc Committee formed on that occasion was assigned the task of reporting on the supplies of, and demands for cooperation among the interested countries.

Also at the Buenos Aires meeting, there were discussions of various matters associated with the movement's position in the international agencies and conferences, with a consideration of the topics at the Second Conference to Examine Implementation of the Treaty on Non-Proliferation of Nuclear Weapons, the activity of the International Atomic Energy Agency, the United Nations conference on promotion of cooperation in the peaceful use of nuclear energy, certain matters relating to unilateral action in the field of international relations in the nuclear area and the restrictions at the Meeting of Nuclear Technology Exporters held in London.

We might assess the results of these conferences as positive, inasmuch as, during the course of them, steps were taken which to some extent fostered subsequent cooperation in the area among interested countries, resulting from a pressing need among



our peoples to help overcome the serious obstacle to economic development represented by the energy supply during the coming years.

The Ministers Conference held in New Delhi during February 1981 underscored the need to continue the work begun on that occasion. Subsequently, in March 1982, the Fourth Meeting of Experts in the Program of Action for Economic Cooperation of the Movement of Nonaligned Nations took place in Havana; and, in the area of peaceful uses of nuclear energy, approved several recommendations for the next meeting of the group of coordinating nations, as well as fostering and backing cooperation in the areas already earmarked by the Ad Hoc Committee.

The Seventh Summit Conference, for its part, devoted attention to the area in several of its principal documents; stressing in the Program of Action for Economic Cooperation the recommendation to continue coordinating efforts in order to promote the interests of the member nations and other developing countries in the various international forums, including the International Atomic Energy Agency, and in particular attempting to attain implementation of the resolutions of this international agency's 25th General Conference, as well as to coordinate the positions of the member nations in the activities in preparation for the United Nations conference for the promotion of international cooperation in the peaceful use of nuclear energy, in accordance with United Nations General Assembly Resolution 32/50.

The Policy Statement of the Seventh Summit devoted attention to matters associated with the area, considering it an inalienable right of all states to carry out their programs for the peaceful use of nuclear energy for the benefit of their peoples; while simultaneously encouraging international cooperation, condemning the disregard by certain countries possessing nuclear technology for the legitimate needs of the developing countries, and expressing its concern at the obstacles still being encountered by the effort to prepare and organize the United Nations conference for the promotion of international cooperation in the peaceful use of nuclear energy.

The disadvantageous position of the countries with fewer resources and opportunities with respect to the option for contemporary energy development served as a seed for the convocation of that conference which, it is thought, will help to solve the problems of unhampered access to technology, equipment, material, personnel training and services required to develop the peaceful use of nuclear energy on equitable, non-discriminatory bases.

At the present time, it is estimated that 9 percent of all the electric power produced in the world is generated by nuclear electric powerplants, based on the experience of a total of over 2,500 reactor-years; and it is expected that, by the end of this decade, 20 percent of all the power produced worldwide will be of nuclear origin.

We might note that the installed capacity of nuclear electric energy in developing countries is 6,190 megawatts, with a total of 12 nuclear energy reactors currently in operation.

Similarly, according to data from the International Atomic Energy Agency of September 1982, by 1990 the developing countries expect to incorporate a total of 29 reactors, with a 26,900-megawatt capacity, in addition to the current ones; while

the developed countries' plan for the same period is for 136 reactors, with a total power of 134,157 megawatts, wherein the plans of France and the Soviet Union alone exceed the total plans of the developing countries.

One can obviously note the slight opportunity for access to development among the poor countries with meager energy resources, since they cannot have a suitable energy base that is guaranteed.

It is a fact that the surmounting of the centuries-old backwardness of the peoples in the developing countries is being seriously hampered by their inability to generate, by themselves, the essential financial resources for this purpose, owing to the distortion of their economic structures as a result of the foreign domination to which they have been subjected for so long.

The current deepseated international economic crisis and the various critical problems stemming from it for our peoples, exacerbated by the history of colonial and neocolonial relations, have demonstrated how inevitable and necessary it is to develop other ties that will make it possible to eliminate the dependence, through diversification of the economic relations among our countries, making use of the potential that neocolonial subordination has prevented us from employing and that exists among us.

At the present time, the cooperation among our countries is not an absurd attempt, but rather is based on needs felt by our peoples, on lessons gained from historical experience and on real, concrete possibilities for cooperation which exist, through the use of common resources and of installed capacity that could to some extent contribute to the development of our battered economies.

The material and human resources that we have at our disposal make it possible for the cooperation among our peoples, properly channeled and materialized, to become a powerful, dynamic factor that will contribute to our autonomous, overall development. That cooperation could be a positive element for the development of productive, technological and commercial relations geared to our realities and development levels; starting with recognition of the heterogeneity of our countries as a means of preventing some from receiving more benefits than others. Hence, it is essential to continue creating concrete relations for cooperation wherever possible.

As everyone knows, the development of nuclear energy is the closest basic solution, particularly for the countries with insufficient energy resources. Nevertheless, as a rule, this solution has been delayed in the developing countries, owing to the restrictions imposed by certain countries exporting nuclear technology, on the one hand; owing to the relatively small size of our countries' electrical systems in comparison with the commercial dimensions of the reactors, the small supply of qualified personnel in this field and the high level of financing required by a nuclear energy program. Moreover, there must be sufficient resources available to spur the progress of different branches of the economy, such as agriculture, food, industry, public health and others as well, with applications of these sources.

The need for international cooperation bearing in mind the economic imbalances that exist among the countries becomes all the more pressing if we include in the analysis the sad reality that, combined with the serious economic crisis that we are confronting at present, our contemporary world is subjected to growing international

tension, which fosters the policy of coercion, threats, destabilization and aggression in international relations, led by the present United States administration, and in fact constituting the deciding factor in the gigantic rise in military spending and the current arms race, causing us to be faced with the most serious threat that one could conceive against the peace and security of all the peoples of the world.

It is obvious that this policy of fomenting an excessive arms race in an attempt to solve the complex problems besetting today's world through the indiscriminate use of threats is nothing more than a fallacy whereby the reactionary forces, consisting of the imperialist powers and their regional policemen, are seeking to deceive peoples, thus concealing their disdain for anything except their own interests.

The increase in military expenditures is reaching astronomical proportions, and it is estimated that, in 1982, the world spent about \$650 billion in that area, in contrast to the grievous social and economic problems that are crushing a large portion of mankind. One can readily observe that only a small portion of those funds would suffice to alleviate such a painful reality; because, in view of the danger involved in an unbridled arming, which includes the development of nuclear weapons representing an affront to human survival, there has arisen the tragedy of genocide by omission, through the stealing of resources needed by peoples to promote their development.

It is for this reason that contributing in any way to halting the international atmosphere of tension and violence is currently, without doubt, the most decisive contribution that our people can offer to the cause of peace, which is one of the intentions of the Movement of Nonaligned Nations; just as the attempt to find the most feasible means for fulfilling their economic interests is unquestionably an expression of the exercise of each state's national sovereignty.

The expedient of nuclear energy as a solution to the problem of electrical generation is a valid present and future option offered to the countries with meager energy resources, and in this enterprise, the role of mutual, non-discriminatory cooperation is highly important.

We are certain that we shall think and act like members of a movement of countries which is manifesting itself as an instrument of peace, national liberation and economic development, and that we shall work untiringly to achieve strong, consistent cooperation among our countries.

The present time in which we are fated to live demands action of a lofty nature, and those of us called together on this occasion shall find a way of rising to the obligation and mission that history has entrusted to us.

Thank you very much.

## Final Report Approved

Havana GRANMA in Spanish 15 Apr 83 p 3

[Text] Yesterday, in this capital, the Second Meeting of the Coordinating Countries in the Area of Peaceful Uses of Nuclear Energy of the Movement of Nonaligned Nations concluded with the unanimous approval of the Final Report.

This document contains the results of the debates held during the 3 days of sessions for the event, at the Convention Palace, with regard to the problems of the peaceful use of nuclear energy and cooperation among the movement's countries in this field.

Dr Fidel Castro Diaz Balart, chairman of this Second Meeting, submitted the draft of the Final Report, after it had been extensively and intensively discussed, for the consideration of the delegates gathered in a plenary session, who approved it completely and without any change.

This fact attested to the great spirit of cooperation with which the delegations attended this event of the nonaligned nations.

In closing the Second Meeting of Coordinating Countries, Dr Fidel Castro Diaz Balart called upon all the delegates to strive so that, in the future, nuclear energy would cease to be a symbol of threats, blackmail and potential danger, and become a factor for development, prosperity and welfare for our peoples and for all mankind.

He stated that the world of tomorrow represents the understanding and effort of all to cooperate and to curb the senselessness and waste, and particularly the threat of extermination hanging over mankind like a sword of Damocles.

Elsewhere in his remarks, he gave a reminder that we are living in a world beset by a deepseated financial and economic crisis, which has brought upon the underdeveloped countries a debt of over \$650 billion, and in which there are 800 million illiterate people, with 12 million children dying each year, 95 percent of them in the developing countries.

The chairman of the Second Meeting also cited the growing need of the underdeveloped countries for housing, food and health, which cannot be met because our peoples' financial resources are becoming increasingly fewer, and cannot fulfill these vital requirements. In this way, he contrasted the tragic state of extreme poverty of many countries with the excessive, irresponsible squandering on the arms race, which must be rapidly curbed.

He stressed that this meeting had served to reinforce the spirit of cooperation that exists in the movement, and its aspiration to hold the United Nations Conference for the Promotion of International Cooperation in the Peaceful Use of Nuclear Energy, at the proper time, and when the conditions to guarantee its success have been created.

And, finally, he expressed his gratitude to the delegates, the organizing committee and all those who, in one way or another, had worked to make the meeting transpire in such an effective manner.

Mr V. Khanna, the Indian ambassador to Cuba, also spoke at this meeting, expressing the pleasure of all the delegations at the facilities and good organization of the function, which contributed to its successful conclusion.

At a press conference, Jorge Morales said that the final document included 13 proposals which expand considerably the area of cooperation among the movement's countries in this area. Stressed as a principal element was the fact that it was decided to extend the term of the Ad Hoc Commission, with the mission of continuing its studies on cooperation until the convening of the Third Meeting of Coordinating Countries.

Also included were 11 references to situations associated with nuclear energy which are related to the movement's countries.

The chair at this meeting took note of the fact that Iraq and Iran offered themselves as sites for the Third Meeting.

2909

CSO: 5100/2060

## BRIEFS

NUCLEAR PLANT COMPLETION NEAR—The future Peruvian Nuclear Research Center which will operate in an area called "Huarangal," 28 km northeast of Lima, looks modern, majestic and solid. Ninety percent of the project has been built, and it is expected to be completed by the end of this year. According to technicians in charge of the construction, 90 percent of the civilian construction part has been completed, which means that the so-called "Heavy work" has been completed. It was said that the 10 percent to be completed includes internal doors, painting, bathrooms, finishing work, and tiling. The construction of the infrastructure began on 8 January 1981 and the project is estimated to be concluded by the end of this year, IPEN [Peruvian Nuclear Energy Institute] President Gen E. P. Juan Barreda Delgado stated. The following parts have been completed to this date: the container of the 10 MW reactor (one of the most impressive non-conventional buildings), the building of the National Radiological Protection Center, the radioisotope production plant and its respective engine rooms, the building for the storage of radiated waste and for the compacting of solid residues, and other supplementary buildings. [Excerpts] [PY211545 Lima EL COMERCIO in Spanish 1 Apr 83 p A 1]

CSO: 5100/2056



## FUTURE NUCLEAR PLANT, PROGRAM DISCUSSED

PY221710 Montevideo EL DIA in Spanish 12 Apr 83 p 6

[Text] Enrique Levrero, acting president of the National Atomic Energy Commission, stated yesterday that a nuclear plant could be operating in the country within 15 years. In this regard he pointed out that the Uruguay should start thinking about it, since it would be the solution to the energy problem. Levrero pointed out that "right now nothing prevents us from developing nuclear energy. The only problem is that the proper conditions for the installation of a nuclear plant do not exist for the time being." "Our electricity network generating capacity and consumption does not justify a nuclear plant right now."

The head of the commission pointed out that "the National Atomic Energy Commission is taking the first steps so that 15, 18 or 20 years in the future when the country's development requires it, we may have a nuclear plant. In this regard we believe that now, that is, 15-18 years beforehand, is the time to start preparing the personnel, the authorities and peoples' awareness so that it will be the solution when we have exhausted all other resources at hand." Levrero made these statements at the end of the inaugural ceremony of the meeting of Latin American experts on nuclear energy within the framework of projects for nondestructive tests. The inauguration took place yesterday morning and will last until 16 April at the headquarters of the National Atomic Energy Commission.

CSO: 5100/2054



BRIEFS

SAVAR RESEARCH REACTOR--A three-megawatt research reactor will be installed at the campus of the Atomic Energy Research Establishment at Savar for applied and basic research programmes and academic training, an official handout said in Dhaka on Wednesday; says BSS. The reactor will for the present be mainly utilized for research in the field of neutron Physics, nuclear and radiochemistry; nuclear analytical chemistry, radio-isotope production for uses in agriculture medicine and industry and non-destructive testing. Bangladesh Atomic Energy Commission has signed a contract with the General Atomic Company USA for supply of the reactor. The construction of the special type reactor building has been started and the reactor is scheduled to be fully commissioned by the middle of next year. The project involves a total expenditures of Taka 13 crore. [Dhaka THE BANGLADESH OBSERVER in English 24 Mar 83 p 12]

CSO: 5100/7088

## ANALYST CLAIMS U. S. STALLING ON TARAPUR PARTS

Madras THE HINDU in English 20 Mar 83 p 1

[Article by G. K. Reddy]

[Text]

NEW DELHI, March 19.

The nuclear contretemps continues to cast a shadow over Indo-American relations even after the transfer of the fuel supply responsibility to France for running the Tarapur plant with enriched uranium.

The U.S. has started stalling over the supply of spare parts for the Tarapur reactors in an obvious bid to extract some assurances on reprocessing of the accumulated spent fuel, contrary to what India was given to understand on the eve of the Prime Minister's visit to Washington.

The Government of India feels that the U.S. is now going back on the implicit promise made last year to supply these essential spares as part of the understanding reached for entrusting France with the task of supplying enriched uranium within the framework of the 1963 Indo-American agreement.

Unfortunately, there are no agreed minutes of what exactly was said by the two sides during various stages of the protracted discussions in Delhi and Washington on this question. The U.S. interpretation of what had been promised in regard to the supply of spare parts does not seem to tally with the Indian impression of the unequivocal nature of this commitment as part of a continuing contractual obligation.

The U.S. took the stand, during the final stages of the discussions that led to the understanding to transfer the fuel supply responsibility to France, that there were three aspects of the Tarapur controversy which could be dealt with separately in their respective spheres.

The first and foremost requirement, it was argued, was to ensure uninterrupted supply of enriched uranium which called for an alternative arrangement.

The second one relating to the legal interpretation of India's rights and obligations over reprocessing the spent fuel, so the argument ran, could be set aside for the present by simply agreeing to disagree, so that it did not come in the way of transferring the fuel supply responsibility to France.

The third and most crucial one on the perpetuity aspects of the safeguards even after 1993, being in-

sisted upon by the U.S. was left in abeyance to be tackled in due course before the actual expiry of the agreement.

The Indian contention is that the promise to supply the spares was an integral part of the understanding reached to transfer the fuel supply responsibility to France. The whole rationale behind this accord was to keep the Tarapur plant running and the denial of essential spares on whatever pretext would deflect this very purpose.

The attempt to relink the spare parts issue with the reprocessing controversy, even after separating the fuel supply issue from it, is seen as an obvious attempt to exert fresh pressures on India to submit to the U.S. concepts of non-proliferation.

The U.S. is trying to create the impression that it is being equally tough, perhaps even tougher, with Pakistan. Though it has followed closely the recent testimony of the Deputy Assistant Secretary of State for South Asian Affairs, Mr. Howard Schaffer, at Congressional hearings on Pakistan's nuclear programme India has no way of judging whether the professed U.S. concern is genuine or only a posture for exerting parallel pressures on it.

**Chinese aid to Pak.**

After a visit to India, Bangladesh and Pakistan next week, Mr. Schaffer is going to China which is outside his territorial jurisdiction, presumably to follow up the talk that the Secretary of State, Mr. George Shultz, had with the Chinese leaders on the grave implications of the reported Chinese assistance to Pakistan in the nuclear sphere.

The U.S. Ambassador to Pakistan, Mr. Ronnie Spiers, is also due to go to China shortly, perhaps to confront the Chinese leaders with what the American Embassy in Islamabad is reported to be claiming to be irrefutable evidence of Chinese help for Pakistan's nuclear effort. He had warned Pakistan in a public speech last year about the very adverse U.S. reaction to the acquisition of a nuclear capability by Pakistan, implying that both economic and military assistance would be cut off by Washington.

UN ENVOY SPEAKS TO CONFERENCE PREPARATION PANEL

New Delhi PATRIOT in English 1 Apr 83 p 3

[Text] UNITED NATIONS, March 31 (PTI)--India took Britain to task at the United Nations for seeking to suggest that peaceful nuclear explosions could become a problem if they were allowed to proliferate.

Deploring what he called this "psychology of paternalism" Indian Ambassador to Vienna S K Singh told the preparatory committee for the UN Conference for Promotion of Nuclear Cooperation in the peaceful uses of nuclear energy yesterday, "while continuing weapon experiments, continuing stockpiling of nuclear warheads are not supposed to contribute to proliferation, peaceful experiments are denounced as threats to world peace."

British representative Micheal Wilmhurst, had said during Tuesday's proceedings of the committee that the public in his country was concerned about non-proliferation and was not "enamoured" of the idea of nuclear explosions.

Mr Singh noted that in the name of realism the British delegate had insisted that the proposed conference should deal only with those aspects of nuclear technology that he might consider "safe enough" in the hands of developing countries.

With obvious sarcasm, Mr Singh added: "those of us who had the experience of colonial administrations, understand that colonial administrations wanted always to prescribe what they considered appropriate or safe for their subjects to be able to handle. This applied to education, science, technology, pharmaceuticals, ammunitions, arms indeed everything."

"It is interesting to see the same evidence of the psychology of paternalism creeping back in the name of proliferation or non-proliferation," Mr Singh said.

Mr Singh said it was interesting also that certain friends of the nuclear weapons States whose nuclear capabilities had reportedly been built up either openly or surreptitiously were never mentioned in this context. "However, whenever the developing world or the world of nonalignment" makes reasonable requests for help or supplies, not even demands, the psychology of paternalism comes rushing to the fore."

The Indian delegate also expressed regret at the "uncharitable criticism" by the British representative of the New Delhi non-aligned Summit declaration, which had referred to the policies of certain nuclear supplier countries aimed at denying the legitimate requirements of developing countries for their own programmes for peaceful uses of nuclear energy.

Mr Singh declared "the non-aligned Heads of State or Government were forthright in stating what did. We do not need any one's permission to speak the truth."

Mr Singh added "had the situation on assurances of supply in the nuclear field improved as much between 1977 and this year, as was claimed on Tuesday by my distinguished colleague from the UK, one might ask with great humility, why then are we carrying on in the committee on assurances of supply in the IAEA context as indeed we are?"

"Why indeed the emphasis that the committee on assurances of supply can somehow be a factor of help perhaps even a factor of impetus, for the work of the UN Conference on peaceful uses of nuclear energy for which this preparatory committee is supposed to be making preparations?"

Mr Singh said the possibility of some developing countries aspiring to utilise nuclear energy for peaceful purposes had been represented by some developed countries, as some kind of a threat. "The thought is purile. Whom can they threaten? What kind of threat can this become?"

We in the developing world can see and assess the situation for ourselves, and are not impressed by all these innuendoes and allegations. No one should have any illusions that the inalienable right of every state to acquire nuclear technology in accordance with its own priorities, interests and needs for peaceful development can be frustrated for ever."

CSO: 5100/7089

## GANDHI REMARKS ON NUCLEAR POWER DEVELOPMENT REPORTED

Madras THE HINDU in English 18 Mar 83 p 6

[Text]

NEW DELHI, March 17.

The total cost of the Madras atomic power project has gone up to Rs. 245.87 crores, according to revised estimates. The original cost estimate was Rs. 132.41 crores.

This was stated by the Prime Minister, Mrs. Indira Gandhi, in the Rajya Sabha today. She said that the original cost estimate for the first stage of the project was Rs. 61.78 crores and Rs. 70.63 crores for the second stage. The revised estimates respectively are Rs. 118.83 crores and Rs. 127.04 crores. The costs have gone up because of escalations in the cost of components and materials and design modifications to incorporate cooling towers and to meet current safety requirements.

The Prime Minister said that the revised cost estimate for the Narora Atomic Power Project, I and II was now Rs. 399.64 crores as against the original estimate of Rs. 209.89 crores. The cost increase had taken place because of change in the scope of the project including augmentation of heavy water upgrading and waste management facilities as well as the inclusion of new works.

Mrs. Gandhi said the Soviet Union had offered assistance to set up a nuclear power station. "A technical team has just returned after discussions

with Soviet specialists. The Government will have to examine the report of the team from various angles before taking a final decision."

"Pursuant to the agreement concluded between India and France on November 28 last year, France in lieu of the United States has agreed to supply enriched uranium for the Tarapur atomic power station within the framework of the 1963 cooperation agreement with the U.S." She said that the offers from the Soviet Union and France were not related and no coordination was therefore called for.

In reply to a question from Mr. V. Gopalswamy and Mr. Venka, Mr. Shivraj V. Patil, Minister of State for Science and Technology, Atomic Energy, Space, Electronics and Ocean Development said that the first unit of the Madras atomic power project was expected to be commissioned this year. The major causes for the delay in the completion of the project were those faced in the indigenisation of major equipment, delays at manufacturers' works due to labour unrest, power cuts, shortage of certain critical inputs and the embargo imposed by some countries on the export of certain equipment and materials. The Government was taking the necessary steps including augmentation of upgradation capacity to build-up the required inventory of heavy water.

CSO 5100/7080

## MINISTER CLAIMS INDIA SELF-RELIANT IN NUCLEAR FIELD

Bombay THE TIMES OF INDIA in English 7 Apr 83 p 14

[Text]

INDIA'S atomic energy programme "is largely self-reliant" and it would not be correct to call its performance in this field as "dismal," the atomic energy minister, Mr. Shivraj Patil, maintained in the Lok Sabha today.

In written answers to several questions on the subject he informed members that the long-term plan proposed by the atomic energy department envisaged a nuclear power generation installed capacity of 10,000 MWE by 2000 A.D. comprising a series of pressurised heavy water reactors of 235 500 MWE unit size.

Regardless of whether the nuclear power programme in almost all other countries had come to a standstill or not, it continued to be India's policy to utilise atomic energy for generation of electricity to the "maximum" possible extent, Mr. Patil said.

Mr. Patil said most of the components and equipment required for the atomic power programme were being manufactured indigenously.

He said except for the recent offer

from the Soviet Union for assistance in setting up a nuclear power station in India, no other offer had been received.

He said work on two of the six reactor units under the sixth plan at Kakrapar in south Gujarat had begun but the decision about sites for the other four units would be taken after the report of the committee set up for the purpose was received and considered by the government. The committee's report on the southern region was being examined by the government, he added.

Mr. Patil said the annual capacity of the heavy water plant at Baroda was 67.2 tonnes of nuclear grade purity. Efforts were being made to optimise production at all the heavy water plants by improving on-streaming procedures and efficient operation and maintenance.

He said the state-owned Indian Rare Earths Limited was setting up a titanium processing plant in Ganjam district of Orissa for producing synthetic rutile (92 per cent titanium dioxide) from ilmenite.

CSO: 5100/7092

SETHNA REPORT TO 23 MAR TOKYO MEETING SUMMARIZED

Madras THE HINDU in English 24 Mar 83 p 9

[Article by K. V. Narain]

[Text] TOKYO, March 23--Mr. H. N. Sethna, Chairman, India's Atomic Energy Commission, addressing the 16th annual conference of the Japan Atomic Industrial Forum Incorporated (JAIF), highlighted the technology developed in India for spent fuel reprocessing and radioactive waste management.

Tracing the course followed by the country over the past two decades, Mr. Sethna said the technological base for both reprocessing of irradiated nuclear fuel and management of highly radioactive waste has been well established for the successful implementation of the nuclear power programme.

Close to a thousand persons from 25 countries, including Japan, the International Atomic Energy Agency, the EEC and the OECD, are taking part in the conference, one of the biggest events in the international atomic energy community. China is taking part for the first time in such an international conference to present its nuclear power development programme.

Basic theme: The basic theme of the conference is "nuclear industry--towards age of maturity". Towards this end, now that the development of light water reactors has reached a step of maturity, the conference aims at propelling forward the speedy development of fast breeder reactors based on a new time scale. The conference is intended to be "a meaningful place for future promotion of nuclear energy development.....towards the maturity of nuclear industry, looking over the world of the 21st Century."

Mr Sethna described India's strategy of nuclear power development as envisaging the installation of natural uranium reactors in the first phase, followed by fast breeder reactors in the second using plutonium from the first phase reactors and using U-238 or thorium as the blanket to be eventually followed by reactor systems based on the 233-thorium cycle. This strategy had necessitated the development of reprocessing of spent fuel as an essential step of the nuclear fuel cycle, Mr. Sethna said.

Referring to the fuel reprocessing programme, Mr. Sethna spoke about the two plants set up at Trombay and Tarapur and the plant being designed for location



near the Madras nuclear power station at Kalpakkam. Experience gained through these plants would be helpful in setting up industrial scale reprocessing plants for irradiated thorium when the need arises.

**Siting of plants:** The siting and sizing of reprocessing plants to cater to India's nuclear power programme may range from small plants of 100 to 200 tons per annum capacity located at nuclear power station sites, as at present, to large industrial plants at an independent site serving many stations, at a later date, he said. According to him, smaller plants of 100 to 200 tons capacity per annum have been considered optimal for at least some time to come.

Mr. Sethna also mentioned the considerable experience gained in the storage of spent fuel, metal and oxide at the reactor sites as well as at reprocessing plants. Limited experience had also been gained in the transportation of spent oxide fuel over long distances by road and rail using casks weighing up to 70 tons and designed and fabricated in the country conforming to relevant IAEA regulations. The cost of reprocessing was also relatively low.

Similarly, the cost of management of high-level radioactive wastes in India, including the projected cost of disposal, worked out to about Rs. 720 a kg of heavy metal reprocessed, which, Mr. Sethna said works out to 0.5 to 1.4 paise a kWhr. of electricity generated depending on whether the fuel has come from a BWR (boiling water reactor) or a PHWR (pressurised heavy water reactor). Thus, the impact of waste management on the cost of electricity generation was only marginal, he said.

CSO: 5100/7082

## EXPERT ADVOCATES NUCLEAR MISSILES FOR SUBMARINES

New Delhi PATRIOT in English 11 Apr 83 p 5

[Text]

Nuclear submarines can be an effective sea-based deterrent for India only if they are equipped with nuclear-tipped missiles. Defence expert says, reports UNI.

Without the missiles these submarines can best be used for surveillance, which nevertheless was an important function.

In any case, India's keeping open the option of nuclear powered submarines makes 'practical sense' only if a good number of them are acquired. Dr K. N. Ramachandran, research associate at the Institute of Defence Studies and Analyses, told UNI in an interview.

He was commenting on Defence Minister R Venkataraman's recent statement on the subject.

Without nuclear missiles, Dr Ramachandran said, the role of the expensive and sophisticated submarines would mainly revolve around surveillance of the country's 8,400 km coastline and its vast exclusive economic zone.

He agreed that the importance of surveillance of the country's surrounding water could not be overemphasised more so because the Andaman and Nicobar and Lakshadweep islands were 'particularly vulnerable' to

attacks in the absence of easy logistics.

But he added, the role of a nuclear powered submarine as a sea-based deterrent made more 'practical and logical sense' when equipped with nuclear missiles.

Whereas nuclear missiles can easily find long-range targets, the main advantage of nuclear submarines lies in their ability to remain submerged for long periods at a stretch and move about noiselessly — twin features that make easy detection very difficult.

Dr Ramachandran felt a nuclear submarine armed with conventional torpedoes was not a practicable proposition for purposes of deterrence. That would be 'rather like using a luxury liner for fishing'.

He said the acquisition of nuclear submarines, if any should be 'sufficiently large'. A small fleet, he explained was 'easier to track and is invariably the first to be hit in a war'.

Dr Ramachandran however pointed out that equipping nuclear submarines with nuclear tipped missiles is a 'long term proposition' involving development of the necessary infrastructure and research and development efforts in related

CSO: 5100/7091

## BHABHA RESEARCH REACTOR MAKING PROGRESS

New Delhi PATRIOT in English 9 Apr 83 p 5

[Text]

The indigenously built R-3 research reactor of the Bhabha Atomic Research Centre (BARC) will be commissioned next year, reports UNI.

Fabrication of first fuel charge for R-3 has made satisfactory progress and progressive commissioning of various sub-systems has started, according to the annual report of the Department of Atomic Energy for 1982-83.

The report, tabled in Lok Sabha on Friday, said the third reprocessing plant to be located at Kalpakkam to reprocess the spent fuel from the Madras atomic power station, as also on a later date from the fast breeder test reactor, was in the final stage of approval.

It said the first unit of the Madras atomic power project (MAPP) was ready to receive heavy water. About 80 per cent of work on the second unit had been completed. Both the units were expected to be commissioned during the sixth Plan.

The report disclosed that BARC has been collaborating with the Bharat Heavy Electricals Limited (BHEL), Bhopal for setting up an experimental coal-

based magneto hydro-dynamic plant at Tiruchirappalli. Most of the work connected with this experimental facility has been completed. Commissioning of the minor and sub-systems has also commenced.

It noted that a new centre for advanced technology for conducting research in the front-line areas of controlled thermal nuclear fusion, lasers, advanced accelerators, micro-electronics, cryogenics and other related areas was proposed to be established at Indore.

The report admitted that there were delays and slippages in the setting up of power projects. The main reasons for this were difficulties faced by indigenous industries in developing advanced technologies, achieving stringent quality control standards and meeting the time schedules for delivery of equipment, besides difficulties encountered in the import of critical equipment.

The department had studied the problems faced in the production of heavy water and operation of power reactors and these were being taken into account while designing and setting up new projects.

CSO: 5100/7090

## MINISTER DENIES STOCKPILING OF PLUTONIUM

New Delhi PATRIOT in English 24 Mar 83 p 5

[Text]

The Government denied in the Lok Sabha on Wednesday reports that India was stockpiling any fissionable plutonium (weapon grade material) and said the country's policy had always been for peaceful use of atomic energy.

Replying to a question of Dr Subramaniam Swamy (Janata) Minister of State for Science and Technology Shivraj Patil, said there was absolutely no truth in the speculation on the subject in the international press.

He said supply of enriched uranium for the Tarapur atomic power station would start arriving soon as per the agreement between India and France.

Mr Patil told Prof Ajit Kumar Mehta that there was no snag in reprocessing spent fuel at Tarapur.

In response to another question Prime Minister Indira Gandhi said the Indo-French agreement for the supply of enriched uranium for the Tarapur station within the framework of the 1965 cooperation agreement with the United States 'is not affected by the Soviet offer of setting up a

nuclear station.

Mr Patil said the rated capacity of the Tarapur nuclear power plants, fixed at 210 MW each had been achieved on several occasions. However, it became necessary to restrict the operating power level due to deficiencies in station equipment and grid.

The present power level was being maintained around 160 MW due to 'uncertainties in the supply of enriched uranium' he said.

The Minister maintained that the performance of the station compared well with similar reactors elsewhere. He denied any breakdown of the laundry equipment.

Mr Patil said the spent fuel from the Rajasthan Atomic power station was being reprocessed in the power reactor fuel processing plant at Tarapur.

Plutonium recovered in the process could be used for power production, he said.

In reply to another question, Mr Patil said the storage capacity for spent fuel at the Tarapur station had been augmented to the extent possible.

CSO: 5100/7083

## DEADLOCK OVER TARAPUR SPARES CONTINUES

Madras THE HINDU in English 24 Mar 83 p 9

[Article by G. K. Reddy]

[Text] NEW DELHI, March 23--The near deadlock of the supply of spare parts for the Tarapur atomic power plant continues despite several rounds of talks between the Government of India and the U.S. Embassy in Delhi.

The U. S. Government, in a renewed bid to extract some assurance from Indai that it will not engage in reprocessing of the American-supplied spent fuel accumulated at Tarapur, has been trying to draw a distinction between what are called emergency-related spares that are urgently required for running the plant and other sensitive items that could conceivably be diverted for other uses even if India has no such intention at present.

Implicit commitment: The Indian stand has been that the commitment to meet the contractual obligation of providing these spare parts was quite implicit in the understanding reached for transferring the fuel supply responsibility to France. But U. S. legal experts have been interpreting this commitment differently, maintaining that the Administration had to satisfy Congress that the relevant provisions of the Nuclear Non-proliferation Act were being faithfully observed by it.

As a sop to India, the U.S. has agreed to ship some non-sensitive spares that are urgently required at Tarapur while retaining the right to press for suitable guarantee about the subsequent supply of sensitive items liable to diversion, but India is refusing to accept this distinction besides declining to compromise, let alone give up, its right to reprocess the spent fuel at any time of its choice.

The U. S. Ambassador, Mr. Harry Barnes, has told the Government that the Reagan Administration was trying to amend the nuclear non-proliferation law, in consultation with the relevant Congressional committees, in the light of the experiences gained and the anomalies that have come to light during the last four years in the operation of this Act. But the same promise of a possible liberalisation of the law was also made during the protracted negotiations in 1981 over the fuel supply obligations.

Firm stand: The Government of India, on its part, has chosen to remain firm and forgo these spare parts rather than submit to the U.S. attempts to exert fresh pressures to undermine indirectly the reprocessing rights. The talks are still continuing and, if there is no change in the U. S. position, India would consider itself free to obtain these spares from other sources or even make them in India with such technological assistance that it is able to obtain from them.

It is difficult to foresee at this stage what turn this controversy might take, since both India and the U. S. are equally keen on keeping it within manageable limits. But otherwise, there are no signs of any U. S. inclination to meet at least this part of its commitment.

CSU: 5100,7082

## INDIA, FRANCE SIGN AGREEMENT ON TARAPUR FUEL

New Delhi PATRIOT in English 24 Mar 83 pp 1, 7

[Text]

India and France have signed an agreement for the supply of enriched uranium for the Tarapur Power Plant which has been working below capacity because of lack of fuel from the United States for the last two years, reports UNI.

The agreement, signed between the Atomic Energy Commission and the French firm "Cogema", a subsidiary of the French Atomic Energy Commission a few days ago, is in pursuance of the understanding reached between United States President Ronald Reagan and Prime Minister Indira Gandhi in Washington in July last.

It was then agreed that France would substitute the United States as supplier of nuclear fuel for the Tarapur plant since

the US could not fulfil its contractual obligations on account of the legislation on full scope safeguards which India did not accept.

According to informed sources, the French supply of fuel would be subject to the same safeguards as visualised in the Indo-US Treaty of Nuclear Cooperation of 1963—namely, without any pursuit or perpetuity clauses.

As agreed to between India and the US in 1971, the safeguards would be monitored by the International Atomic Energy Agency (IAEA).

The conclusion of the agreement ends uncertainties regarding fuel supplies for the Tarapur plant which was now expected to work to its full capacity of 420 megawatts.

CSO: 5100/7083



## EDITORIAL NOTES TARAPUR'S 'ONGOING TRAVAILS'

Madras THE HINDU in English 24 Mar 83 p 8

[Editorial]

[Text] THE ATTEMPT OF the United States to link its promised supply of spare parts for the Tarapur nuclear power plant with the issue of the reprocessing of the accumulated spent fuel is only a fresh expression of the unreliable and obstructive nature of that country's nuclear supply and "non-proliferation" policy towards India. In the earlier period, the U.S. sought to use its supply of low-enriched uranium fuel for the station as leverage to push the Indian Government towards acceptance of fullscope safeguards — that is external inspection and control over the entire range of the nation's nuclear energy activity. Having failed to achieve this objective, it has concentrated on tying India's hands with respect at least to Tarapur. In particular, it has targeted the plan to reprocess the spent fuel accumulated at the plant. The 1963 agreement for bilateral nuclear cooperation, specifically provides for reprocessing under safeguards after a joint determination by the two parties on the safeguardability of the reprocessing plant. In the three rounds of Tarapur negotiations in 1981, the head of the U.S. delegation, Mr. James Malone, explicitly stated that his Government would not object to the reprocessing of the spent fuel provided there was an overall settlement of the issues. In fact, in the final round in Washington (November 1981), he went on record with the promise that, in the event of an agreed termination of the fuel supply relationship, "the U.S. would be giving up its right of joint determination". It is well known that the Reagan administration went back on this commitment in the immediate wake of the deal on Tarapur struck on the occasion of the Prime Minister's visit to the U.S. in mid-1982. Both the External Affairs Minister and the Prime Minister have since reiterated India's independent right to reprocess the spent fuel without further consultation, with the latter declaring in Parliament: "The American Government does have reservations on this, but it does not make any dif-

ference to us".

Now, some months later, the U.S. is stalling delivery on its promise to supply spare parts to the Tarapur power plant, using this apparently as leverage to obstruct India's reprocessing of the spent fuel — which it earlier promised not to obstruct. The arrangement bringing in France as a substitute supplier of low-enriched uranium fuel is based on the terms that only Article II A of the 1963 agreement — dealing with the U.S. commitment to supply fuel "as needed" to Tarapur — stands suspended and that the 1963 Indo-U.S. agreement "shall remain in effect in all other respects". Article V, which is very much in force, relates to the U.S. commitment to allow persons within its jurisdiction to transfer and export "materials, equipment and devices, other than source or special nuclear materials" to India. This legal obligation aside, the U.S. led the Government of India (in mid-1982) to believe that, once it struck a deal with France which would keep IAEA safeguards in place, supply of the essential spare parts for Tarapur was guaranteed. For the nation, the lesson of the ongoing, chequered story of Tarapur extends far beyond its modest contribution to power generation and even the safety-related issues involved. Once the guard is lowered and vacillation shown on basic nuclear policy issues, the external obstructor will seek to set the terms and use every opportunity to complicate matters that seem simple on a superficial reading. The time has come for New Delhi to warn Washington publicly that if it persists in this course and goes back on terms solemnly agreed upon, India would be under no obligation whatsoever to recognise any residual U.S. "rights" or role at Tarapur. One party to an international agreement cannot persistently flout its most basic terms and insist that the other continue to be bound by them, no matter the resultant manifest disadvantage.

## SETHNA REMARKS ON RECEIPT OF NARORA FUELING MACHINE

Bombay THE TIMES OF INDIA in English 11 Mar 83 p 9

[Text]

HYDERABAD, March 10: Mr. H. N. Sethna, chairman of the Atomic Energy Commission, today indicated that nuclear fuel for the Tarapur plant, which would be processed at the nuclear fuel complex here, was expected to be received from France in the next two or three months.

Talking to newsmen after symbolically receiving at an impressive function the 45-tonne fuelling machine fabricated by a Hyderabad firm for the Narora atomic power project, Dr. Sethna said the equipment was the "heart" of the refuelling operation in high radiation areas. He paid rich compliments to the manufacturers, Machine Tool Aids and Reconditioning, for fabricating it for the first time in India.

The AEC chairman is apparently scared of parliament. He declined to entertain questions, saying that parliament was in session. "Whether I respond to your question or not at all, it puts me in trouble," he remarked. And wherever he did respond, it made little news as it was mostly repetition of well known facts about atomic energy programmes.

On the Narora project, however, he readily replied to questions. "As I have already replied to parliament about it." The plant was different from others and was designed to meet the exigencies of a "seismic zone."

Asked why a vulnerable zone was at all selected for a sensitive project like a nuclear station, Dr. Sethna said, "It was a 64,000 dollar question. What is a 'quiet zone' and what is a 'seismic zone'?" he asked.

The first of the two 235-MW. units of the Narora project was expected to be completed by 1986, he added.

CSO: 5100/7075

## CENTER FOR ADVANCED TECHNOLOGY RESEARCH PROPOSED

New Delhi PATRIOT in English 11 Apr 83 p 5

[Text]

A new centre for advanced technology for conducting research, in the front line areas of controlled thermal nuclear fusion, lasers, micro-electronics and cryogenics and other related areas is proposed to be set up at Indore, reports PTL.

According to the 1982-83 annual report of the Department of Atomic Energy, work has also been taken up to set up a medium energy heavy ion accelerator at Tata Institute of Fundamental Research, Bombay.

The report said that the first unit of the Madras Atomic Power Project (MAPP) is ready to receive heavy water. For the second unit, about 89 per cent of the work has been completed. Both the units are expected to be commissioned during the current five-year plan period.

At Narora (UP) 68 per cent of the work has been completed. The two units are scheduled to be commissioned during 1986-87 and 1987-88 respectively.

The report noted that the major factors contributing to delays and slippages in the setting up of nuclear power projects in the past have been difficulties encountered by indigenous industries in developing advanced technologies required.

The other factors listed were failure to achieve stringent quality control standards and meeting time schedules for delivery equipment besides the difficulty encountered in the import of critical equipment.

The report said a fast breeder test reactor would be commissioned by 1984 at the reactor research centre, Kalpakkam, all the major equipment (including reactor research vessels) and components have been received and are

being progressively installed.

The report said of the five heavy water plants, the one at Naggal, Baroda and Tuticorin are under operation. Talcher and Kota plants are under commissioning.

Realising the need for production of heavy water on acceptable and economic terms and to meet the rapidly increasing demand for heavy water, action has been initiated for scaling up of the capacity and simplifying the design of plants.

Work has started on the setting up of two new heavy water plants — Thal Valsbet project (110 tonne capacity per annum) and Manuguru project (AP) — 185 tonnes per annum). Both the projects are expected to be on stream by 1987.

The report said that the heavy water plant at Tuticorin, based on ammonia hydrogen exchange process operated at better than 70 per cent recovery efficiency during the month of May last year till the run was interrupted by a power failure. The experiment has demonstrated the viability of the process and of the technology adopted at the plant, it said.

Revenue from the sale of isotopes and from commercial services related to the application of isotopes during 1982-83 amounted to Rs 15 million. About 45,000 consignments of radio isotopes and related equipment were supplied to users in the country and abroad.

Evolving a methodology in cancer treatment particularly of the breast is being tried out at the Tata Memorial Hospital, Bombay.

Breast preservation in selected patients by sophisticated surgical and radiation techniques have been successfully tried, the report said.

## BRIEFS

**SAHA INSTITUTE DIRECTOR**--The governing body of the Saha Institute of Nuclear Physics, Calcutta at its meeting in Bombay on Wednesday decided to appoint Mr Manoj Kumar Pal, professor of Theoretical Physics at the institute as its director. Mr Pal has been associated with the institute since 1954 and has conducted research on different aspects of Theoretical Physics. He is also associated with the Nobel Prize Winner Professor Abdus Salam's International Institute of Theoretical Physics, Trieste. Since the retirement of Mr D. N. Kundu in 1979 the post of director in the institute has been vacant. Occasionally, some teachers were appointed on a temporary basis. The governing body's decision was conveyed to Mr Pal on Thursday by Mr R. K. Poddar, Vice-Chancellor, Calcutta University, who attended the Bombay meeting. Mr Pal was among several candidates who had applied for the post. The selection committee's decision to appoint him was unanimous. [Calcutta THE STATESMAN in English 11 Mar 83 p 6]

**NUCLEAR PLANT SITES**--NEW DELHI, March 16. (PTI & UNI)--A COMMITTEE has been appointed by the government to select suitable sites for the location of atomic power plants, the Lok Sabha was informed today. A decision on the setting up of an atomic power plant in the southern region can be taken after the report of the committee is considered by the government, Mr. Shivraj Patil, minister of state for science and technology, told Prof. P. J. Kurien in a written reply. The minister admitted that Kerala had also requested for an atomic power plant. Mr. Patil said it was the policy of the government to strive for self-sufficiency in the development of atomic energy. Steps had been taken for training of manpower, development of specialised processes and infrastructure to manufacture special nuclear equipment and materials. He said the department had acquired considerable experience in the extraction of thorium from monazite sands. [Bombay THE TIMES OF INDIA in English 17 Mar 83 p 6]

**NUCLEAR SELF-RELIANCE**--The Government has taken a number of measures to achieve self-sufficiency in the field of atomic energy, report agencies. Minister of State for Science and Technology Shivraj Patil told the Lok Sabha on Wednesday that the measures included training of manpower, development of specialised processes and infrastructure to manufacture special nuclear equipment and materials needed for the nuclear power programme and for nuclear applications in industry, medicine, agriculture and other areas. He said that the department of atomic energy had already acquired considerable experience

in the extraction of thorium from the monazite sands. Research and development work was being undertaken for the use of thorium in various reactor systems, he added. He said 70 per cent of the work on the Narora atomic power project had been completed. The indigenous content of the Narora plant was about 90 per cent in terms of cost. [New Delhi PATRIOT in English 17 Mar 83 p 5]

THAL HEAVY WATER PROJECT--NEW DELHI, March 22 (PTI)--Work on the Thal-Vaishet heavy water project in maharashtra is expected to start by June this year, the chemicals and fertilisers minister, Mr. Vasant Sahe, told the Lok Sabha. The project was being set up in the area acquired for the Thal fertiliser project. Work on design, engineering and equipment procurement was progressing, he said. [Bombay THE TIMES OF INDIA in English 23 Mar 83 p 7]

NUCLEAR ENERGY PLANS--The Government will examine from various angles, the Soviet offer of assistance in setting up a 1,000 MW nuclear power station in the country, Prime Minister Indira Gandhi informed the Lok Sabha on Wednesday, reports PTI. A technical team recently visited the Soviet Union to ascertain various details of the offer she told Mr Anand Singh and Dr Vasant Kumar Pandit. No other country has made a similar offer, Mrs Gandhi added. A long term plan, proposed by the atomic energy department, envisages a nuclear power generation capacity of 10,000 MW by 2,000 AD Minister of Science and Technology Shivraj Patil told Mr Phool Chand Verma and Mrs Kishori Sinha. The proven reserves of uranium were considered adequate for the purposes of the currently envisaged nuclear power programme, he told Mr M V Chandrashekara Murthy and Mr Anantha Ramulu Mallu. Replying to Mr M Ramgopal Reddy he said the cost of Madras Atomic Power Project-I had gone up from Rs 61.78 crore to Rs 118.83 crore, that of project-II from Rs 70.63 crore to Rs 127.04 crore and Narora Atomic Power Project I and II from Rs 209.89 crore to Rs 399.64 crore. [New Delhi PATRIOT in English 24 Mar 83 p 5]

URANIUM OXIDE FUEL--NEW DELHI, March 24--India is developing the capability to produce uranium oxide as fuel for atomic power plants, the Minister of State for Science and Technology, Mr. Shivraj Patil, told the Rajya Sabha today. He told Mr. Chengalraya Naidu that India had, at present enough of uranium oxide for producing energy. It was for refining the uranium that they had to depend on other countries. To supplementaries from Mr. Jaswant Singh, Syed Shahabuddin and Mr. Babhubai Patel, the Minister said the capital cost of producing 100 MW of nuclear power worked out approximately to Rs. 100 crores. India had enough of natural uranium. [Madras THE HINDU in English 25 Mar 83 p 6]

SOVIET NUCLEAR AID--MOSCOW, March 25--The Soviet Union is inclined to setting up one or two atomic power stations of 440 MW capacity each in India, instead of a single 1,000 MW plant, if India prefers this. Soviet Union is believed to have conveyed this to an Indian delegation which recently visited some of the atomic power stations in the USSR. The Soviet Union had offered to build a 1,000 MW atomic power plant during the Prime Minister, Mrs. Gandhi's visit to Moscow. According to informed sources, the Soviet suggestion is expected to be discussed at the coming meeting of the monitoring group formed to review the execution of tasks set by the Indo-Soviet Economic, Technical and Scientific Commission. [Madras THE HINDU in English 26 Mar 83 p 5]

## BRIEFS

NUCLEAR FUEL DEVELOPMENT PROJECT--A group of entrepreneurs and investors wants to develop nuclear fuel in Israel by a new process which cannot be used for military purposes. An Israeli team of international renown in this field has the exclusive knowhow for the production of the fuel, which is based on the element thorium. Preliminary tests have already been conducted and they will continue over the next 2 years, but the talks are continuing between the entrepreneurs and government experts on whether to develop the fuel in Israel. Among those supporting the entrepreneurs are internationally known experts, including Edward Teller. [Text] [TA040543 Jerusalem Domestic Service in Hebrew 0500 GMT 4 May 83]

CSO: 5100/4506

KOEBERG COMMISSIONING 'SERIOUSLY SET BACK' BY SABOTAGE

Johannesburg THE CITIZEN in English 28 Apr 83 p 4

[Text]

THE sabotage attempt at Koeberg power station last December seriously set back its expected date of commissioning, the Minister of Mineral and Energy Affairs, Mr Pietie du Plessis, said yesterday.

Speaking on his Budget Vote, he said the direct cost of the damage was relatively small compared with the consequential costs.

"The final report regarding the sabotage incident is not yet available but I have received a report from Eskom."

According to the report, nobody was injured as a result of the explosions, no radiological hazard arose and recovery work was well advanced.

"The direct cost of the damage is relatively small in comparison with the consequential costs, due to the delay in the commissioning of Koeberg, and is partly covered by insurance," said Mr Du Plessis.

"Every effort is being made to minimise the consequential costs and the main objective of Eskom's ongoing negotiations with the contractor and other parties concerned is to ensure the earliest practicable power generation.

"As far as security measures are concerned, Eskom has

drastically improved the original measures, as foreseen in 1976, in the light of the presentday world-wide increase in terrorist activities.

"It was, therefore, necessary to develop and add to the original concepts in the course of building and commissioning of the power station.

"I want to reiterate that neither of the two units will be commissioned at the expense of safety, or before the licensing authorities and the Government are convinced that the security measures have been brought to an acceptable standard and that Koeberg can be operated with safety."

The Minister gave the assurance that, before commissioning, the reactors would be completed to such an extent that the construction workers would have left and only such staff of the contractor and Eskom, who would be involved with the commissioning, would have access to the reactor building.

"It is not considered to be in the interest of security to disclose exact details regarding the financial losses incurred in the sabotage incident at this juncture," he said.



CONCERN OVER STOLEN RADIOACTIVE DEVICE GROWS

Johannesburg THE CITIZEN in English 28 Apr 83 p 5

[Text] AN official of the Nuclear Development Corporation, members of the SA Police and members of Civil Defence held discussions in Durban yesterday after a radioactive device was stolen from a bakkie in Victoria Embankment at the weekend.

Mr Adriaan Hanekom of the NDC said that if the core was removed from its container and left for the night in a room with a person that person would have a 50 percent chance of survival.

The demo-radiography container containing a radioactive isotope about the size of a match head, was stolen from a bakkie belonging to a Durban engineering inspection company.

Repeated pleas by police since Monday for anybody with any knowledge of the theft to contact the nearest police station have been unsuccessful.

Mr Hanekom again appealed to the public to contact the police or Civil Defence if anybody see or knows the whereabouts of the radioactive device.

In Durban the branch manager of the engineering company, Mr Charles Perry said a full report of circumstances surrounding the theft had been forwarded to the Atomic Energy Board in Pretoria.

He said that the device is perfectly safe if not tampered with. There is no radiation from it whatsoever. It was used daily to X-Ray the internal quality, Mr Perry said.

"It is dangerous only if it is opened and physically handled.

CSO: 5100/35

## BRIEFS

POSSESSION OF URANIUM--WINDHOEK--A Windhoek man, Joseph Ujaha (33) was fined R2 000 (or one year) in the Windhoek Magistrate's Court on Tuesday for unlawful possession of uranium. A further two year's imprisonment was suspended for three years. Ujaha, who lives in Katutura, was arrested in a police trap with 8 kg of unrefined uranium. [Text] [Johannesburg THE CITIZEN in English 28 Apr 83 p 9]

HANDY RADIATION METER--Plessey Controls has designed and manufactured a portable meter to read nuclear radiation levels for the prediction of safe areas. Called the Plessey Portable Dose Rate Meter, it is a battery-operated micro-computer based unit and incorporates self-testing and fault indication. It weighs 560 g and is waterproof. Originally developed in Britain, the meter is intended for post-incident monitoring by civil defence and other services. [Text] [Johannesburg THE STAR in English 15 Apr 83 p 7M]

STOLEN RADIOACTIVE DEVICE FOUND--DURBAN--Police have found the potentially deadly radioactive device stolen four days ago from a bakkie in Durban. Its disappearance had led to an emergency hunt involving Atomic Energy Corporation officials and scores of municipal employees. The CID officer in charge of the investigation, Captain Carel Erasmus, said he and two colleagues had found the container in the Durban area on Wednesday night. Five men have been arrested. "The container was found intact and had not been tampered with. It has been tested and there is no chance of anyone having picked up side effects from having been in contact with it. We have handled it ourselves," said Capt Erasmus. The police team had worked round the clock on the case since the weekend. Special instruments to detect radiation exposure rates were flown to Durban late on Wednesday from the Atomic Energy Corporation's headquarters at Pelindaba, near Pretoria. They were to be used in case the container had been opened and an iridium-192 stainless steel capsule, containing the potentially lethal radioactive source, removed from it. [Text] [Johannesburg THE CITIZEN in English 29 Apr 83 p 9]

CSO: 5100/51

PLANNING FOR URANIUM REPROCESSING PLANT PROCEEDS

Bonn DIE WELT In German 5 Apr 83 p 4 excerpts

/Article by Peter Schmalz, Munich/

/Text/ The two Germans agree: "The French are miles ahead of us, and they are doing a billion dollar business."

The two are professionally in favor of reprocessing: They are employees of the "German Society for the Reprocessing of Nuclear Fuels," called DWK for short. But the harmony is deceptive, because the two of them are involved in a hard internal competition. Rainer Goehring, as local representative of Dragahn, wants to build the first German reprocessing plant in Lower Saxony. Walter Weinlaender, as a DWK man in the Upper Palatinate Schwandorf, wants to bring the 4-billion project to Bavaria. Weinlaender is convinced: "The advanced plans are in Bavaria." There, the process of atomic law has been going for a year, after a regional planning process had reached a positive conclusion. The DWK expects the first partial erection approval in 2 years, and the final operating approval could then be granted in 1992.

However, the hopes of the DWK are spiced with skepticism. The planning and political tragedy concerning waste removal from German nuclear power plants has been too great, since the Ministerial President of Lower Saxony, Ernst Albrecht, has dumped as "politically not feasible" the integrated waste disposal center in Gorleben - with receiving depot, reprocessing, and final depot, praised worldwide as the best solution. Thereupon, the DWK sought new locations in Bavaria, Hessen, and Rhineland-Palatinate, for a new reprocessing installation, but only in Bavaria did the planning proceed apace.

During a breakfast in connection with a conference of ministerial presidents in Kiel, a serious preliminary decision was then made last fall: Bernhard Vogel and Holger Boerner relinquished their site, Franz Josef Strauss stuck with his decision for Bavaria, and Ernst Albrecht announced his surprising new interest in such an installation, naming Dragahn in Luechow-Dannenberg as a site.

Since that time insiders have been speaking of a competitive fight for the project on the part of the two federally governed provinces. Both ministerial presidents are hoping that the construction and operation of such an installation would produce perceptible economic stimuli for structurally weak regions. Their

view is supported by an expert opinion from the "German Institute for Economic Research" (DIW, Berlin). This envisions the building investments of 4 billion DM as causing a total economic production of goods and services in the amount of about 10 billion DM. This corresponds to an employment impulse of 80,000 man years, creating and securing 11,000 jobs during the 7-year construction time. Operation of the installation will annually produce goods and services amounting to about 1.7 billion DM. In the long term, this will secure 8,000 jobs.

The DWK is currently making parallel plans in Bavaria and Lower Saxony. The installations are designed identically for processing 350 tons uranium per year, with a possible doubling to 700 tons. However, at least at first only a 350-ton installation is to be built, although the construction of two large installations would be economically the most sensible solution. By the end of the century, the planned German nuclear power output is 30,000 to 35,000 megawatts, creating annually 1,000 tons of burned-out fuel elements. If the Federal Republic had reprocessing capacity in excess of this, it could offer the excess capacity on the world market and thus do a business in the billions. In any case, the French are planning a major economic entry into the lucrative business of reprocessing.

The national firm "Cogema", which is operating the installations in Marcoule and in the northern French La Hague, has concluded a contract with the Federal Republic. According to this contract, the fuel elements produced in German nuclear power plants until 1986 will be reprocessed in a new installation in La Hague. The Federal Republic will pay 3.5 billion DM for this. Walter Weinlaender: "When the contract expires, the French will have a new installation which has been financed by us." Nevertheless, despite the high economic gain, even DWK experts regard the reprocessing of fuel elements in the Federal Republic as politically unfeasible.

In the inner circles, the fear is even expressed that the German utility enterprises, which founded the DWK as a subsidiary for waste disposal from their nuclear power plants, can completely give up any project of their own. They can withdraw their billion mark contributions from the German economy and can continue to rely on international contracts, primarily with France. A DWK employee said to the WELT: "In terms of operating economics it would make no difference where the Germans do their reprocessing; however, in terms of the national economy, reprocessing abroad would damage us severely."

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NUCLEAR INSPECTION AGENCY REFUSES RINGHALS 3 POWER INCREASE

Stockholm DAGENS NYHETER in Swedish 24 Mar 83 p 37

[Article by Peter Sandberg]

[Text] Goteborg, Wednesday--The National Nuclear Inspection Agency (SKI) probably will not permit the State Power Board to increase the power output of Ringhals 3 before the steam generator that caused the shutdown in the fall of 1981 has been replaced. One of SKI's advisory boards made this recommendation and SKI probably will follow its advice.

In the fall of 1981 Ringhals 3 was shut down because the pipes in the steam generator could not withstand the stress to which they were subjected during full power output. The pipes were worn.

Later the State Power Board was permitted to operate the reactor at reduced power. It now is operating at 40 percent of capacity. The State Power Board has requested permission to operate at 47 percent, but the Reactor Safety Board has advised against this and SKI probably will follow this advice.

"Not Risk"

"We know the pipes begin to wear away between 40 and 50 percent and since no measures have been taken to prevent wear, we do not wish to take the risk," interim head of SKI Lars Gunnar Larsson said.

The local safety board in Varberg had its first meeting of the year on Wednesday. It was informed of the situation at the four reactors.

Ringhals 1 will be shut down soon so that engineers can see how serious the problem of "intercrystalline stress corrosion" (also called rust) is. The other four boiling water reactors in Sweden will undergo the same test.

In other countries, similar problems in certain boiling water reactors have been extremely serious and have necessitated repair work that is extremely difficult from a radiation protection standpoint.

In many cases, the problem has been so great that it has been difficult to

determine whether or not it would be profitable to continue using the reactor. The extent of the problem in the Swedish boiling water reactors will be known only later this year, after the inspection.

Ringhals 2 "Washed"

At Ringhals 2 engineers hope to impede crack formations in the steam generators by "washing" them internally.

Ringhals 4 is being renovated and will be tested in the near future with the rebuilt steam generator. Whether or not the reactor ever will operate at full power will be known only after a year or so.

During the summer Ringhals 3 will be reconstructed in the same manner as Ringhals 4.

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# RINGHALS 1 NUCLEAR PLANT FACES LARGE-SCALE REPAIRS IN PIPES

Stockholm DAGENS NYHETER in Swedish 20 Apr 83 p 45

**[Text]** Ringhals 1 nuclear reactor was put back into operation again Tuesday after being shut down since Easter due to the threat of radioactive leaks. The Nuclear Energy Inspection Commission (SKI) reported that minor repairs will take care of the problem until midsummer.

When this report was issued, the repairs had been completed and the nuclear reactor was being readied for operation.

Leaks were detected in some of the pipes in Ringhals 1 last fall. The diagnosis was a so-called boiler problem, which can cause cracks to develop in rustfree pipes. It is referred to as inter-crystallization--tension corrosion--which occurs in steel pipes where the carbon content is high.

The leaks were repaired and Ringhals 1 was allowed to operate until Easter, when careful checks were to be made. These were performed and, of the 37 sections of pipe inspected, 28 were found to suggest cracks.

Vattenfall submitted a repair program, which has now been approved by the Nuclear Energy Inspection Commission. It simply suggests welding a new piece atop the sections of pipe which present a risk of developing cracks.

"The method is completely safe and there is no risk of leakage in those pipes now," said SKI information chief Goran Mandeus.

But all the pipes are supposed to be replaced this summer with new steel pipes containing less carbon.

That will be done during the regular summer shutdown and will cost Vattenfall about 5 million kronor.

The reactor will be ready to run again at the end of September.

There is the risk of another four of Sweden's nuclear reactors having the same problem. Barseback 1 and 2, as well as Oskarshamn 1 and 2 are boiler reactors, like Ringhals 1.

Vattenfall will keep checking them until August, when SKI will once more deal with the situation.

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